DOCUMENT RESUME

ED 330 977 CG 023 320

AUTHOR	Bachman, Jerald G.; And Others
TITLE	Changes in Drug Use after High School as a Function of Role Status and Social Environment. Monitoring the Future. Occasional Paper Series, Paper 11.
INSTITUTION	Michigan Univ., Ann Arbor. Inst. for Social Research.
PUB DATE	81
NOTE	113p.
PUB TYPE	Reports - Research/Technical (143)
EDRS PRICE	MF01/PC05 Plus Postage.
DESCRIPTORS	Attitudes; *Drug Abuse; Drug Use; *Employment Level; Followup Studies; Higher Education; High Schools; High School Seniors; *Illegal Drug Use; *Incidence; Life Style; *Marital Status; National Surveys; *Social Environment; Trend Analysis; Values; Young Adults
IDENTIFIERS	Monitoring the Future; Role Status

ABSTRACT

Relatively little longitudinal research exists on the progression of drug-using behaviors through the early adult years, a period during which young people make a number of important transitions in social environments, primary activity, and marital status. Using data from the national study, Monitoring the Future, changes in the use of cigarettes, alcohol, marijuana, and other illicit drugs by young adults after high school were examined for various groups defined in terms of living/marital situation, student status, and employment status. Results indicated that post-high school drug use was highly predictable from senior year drug use. The use of alcohol, marijuana, and other illicit drugs (but not cigarettes) seemed also to be influenced by post-high school living arrangements. More specifically, living with a spouse seemed to reduce drug use, living with parents tended to continue the senior year status quo, living with a partner tended to mostly increase drug use, and other living arrangements, including dormitories, also tended to increase use. These relationships were largely unaffected by the inclusion of other predictor dimensions. (Author/BHK)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED330977

CG023320

monitoring the future

occasional paper series

paper 11

CHANGES IN DRUG USE AFTER HIGH SCHOOL AS A FUNCTION OF ROLE STATUS AND SOCIAL ENVIRONMENT

Jerald G. Bachman
Patrick M. O'Malley
Lloyd D. Johnston

BEST COPY AVAILABLE

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☑ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

- Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

J. G. Bachman

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

Monitoring the Future: A Continuing Study of the Lifestyles and Values of Youth

As its title suggests, this study is intended to assess the changing lifestyles, values, and preferences of American youth on a continuing basis. Each year since 1975 about 17,000 seniors have participated in the annual survey, which is conducted in some 130 high schools nationwide. In addition, subsamples of seniors from previously participating classes receive follow-up questionnaires by mail each year.

This Occasional Paper Series is intended to disseminate a variety of products from the study, including pre-publication (and somewhat more detailed) versions of journal articles, other substantive articles, and methodological papers.

A full listing of occasional papers and other study reports is available from Monitoring the Future, Institute for Social Research, The University of Michigan, P.O. Box 1248, Ann Arbor, MI 48106.

CHANGES IN DRUG USE AFTER HIGH SCHOOL AS A FUNCTION OF ROLE STATUS AND SOCIAL ENVIRONMENT

Monitoring the Future Occasional Paper 11

Jerald G. Bachman
Patrick M. O'Malley
Lloyd D. Johnston

Institute for Social Research
The University of Michigan
Ann Arbor, Michigan

1981

CONTENTS

Page

INTRODUCTION 1

Living Arrangements/Marital Status 2
Employment Experiences. 3
Educational Experiences 3

METHODS 4

Overview of Research Design 4
Base Year Data Collections from Seniors 4
Follow-Up Data Collections 4

Accuracy and Representativeness of Findings 5

Analysis Strategy 6
Specification of Panels for Analysis 6
Specification of Variables and Analysis Methods. 7
Measures of Post-High School Role Status and Environment . . 8
Measures of Drug Use 10

RESULTS 12

An Overview of Change and Stability in Drug Use 12
Overall Shifts in Levels of Drug Use 12
Stability in Relative Ordering of Drug Use Scores 14

"Before and After" Drug Use Levels Related to Post-High School Role Status and Social Environment 15
Living Arrangements/Marital Roles Status 15
Student/Employment/Homemaker Status 17

Regression Analyses Examining the Impact of Post-High School Experiences 19
First Set of Regressions: Controlling Base-Year Use of Drug 21
Second Set of Regressions: Adding Further Base-Year Predictors 22
Third Set of Regressions: Brief Exploration of Other Post-High School Factors Potentially Related to Drug Use . . 23
Detailed Examination of First Set of Regressions 24
Further Examination of the Impacts of Unemployment Experiences 26

DISCUSSION 27

(continued next page)

TABLES AND FIGURES 33

APPENDIX A: Research Design and Procedures. 59

APPENDIX B: Estimates of Reliability of Drug Use Measures. 65

APPENDIX C: Matrix of Product-Moment Correlations 77

REFERENCES 89

LIST OF TABLES

Tables		Page
1.	Percentages of Follow-Up Respondents According to Student Status	34
2.	Percentages of Follow-Up Respondents in Various Employment Roles	35
3.	Percentages of Follow-Up Respondents in Different Living Environments.	36
4.	Levels of Drug Use Reported by Base-Year and Follow-Up Respondents: Percentage Distributions, Means, Standard Deviations and Gains (Class of 1977 followed up in 1978, 1979, 1980)	37
5.	Auto correlations (Base Year with Follow-Up) for Drug Use Measures.	40
6.	Explained Variance Using Different Combinations of Base Year and Follow-Up Variables to Predict Follow-Up Use of Five Classes of Drugs: 1-, 2-, and 3-year Cohorts Combined, BY75 - 79.	41
7.	Monthly Use of Cigarettes (Follow-Up Measure Scaled 1 - 7) Predicted from Senior Year Cigarette Use, Sex, and Post-High School Role Status Measures.	43
8.	Instances of Heavy Drinking in Past Two Weeks (Follow-Up Measure Scaled 1 - 6) Predicted from Senior Year Heavy Drinking, Sex, and Post-High School Role Status Measures	44
9.	Annual Use of Alcohol (Follow-Up Measure Scaled 2 - 11) Predicted from Senior Year Alcohol Use, Sex, and Post-High School Role Status Measures.	45
10.	Annual Use of Marijuana (Follow-Up Measure Scaled 2 - 11) Predicted from Senior Year Marijuana Use, Sex, and Post-High School Role Status Measures.	46
11.	Annual Use of Other Illicit Drugs (Follow-Up Measure Scaled 2 - 5) Predicted from Senior Year Other Illicit Drug Use, Sex, and Post-High School Role Status Measures	47

LIST OF FIGURES

Figure Page

1. One-Year, Two-Year, and Three-Year Panels Specified by Dates of Base-Year and Follow-Up Surveys 48

2. Marijuana Use in Past 30 Days by Living Environment: Base Year and Follow-Up Percentages Shown Separately for 1-, 2-, and 3-year Cohorts (BY75-79) . . . 49

3. Use of a Half Pack or More of Cigarettes Daily by Living Environment: Base Year and Follow-Up Percentages (1-, 2-, and 3-year Cohorts Combined) 50

4. Instance of Heavy Drinking in Past Two Weeks by Living Environment: Base Year and Follow-Up Percentages (1-, 2-, and 3-year Cohorts Combined) 51

5. Marijuana Use in Past 30 Days by Living Environment: Base Year and Follow-Up Percentages (1-, 2-, and 3-year Cohorts Combined) 52

6. Other Illicit Drug Use in Past 30 Days by Living Environment: Base Year and Follow-Up Percentages (1-, 2-, and 3-year Cohorts Combined) 53

7. Use of a Half Pack or More of Cigarettes Daily by Student/Employment Status: Base Year and Follow-Up Percentages (1-, 2-, and 3-year Cohorts Combined) . . . 54

8. Instance of Heavy Drinking in Past Two Weeks by Student/Employment Status: Base Year and Follow-Up Percentages (1-, 2-, and 3-year Cohorts Combined) . . . 55

9 Marijuana Use in Past 30 Days by Student/Employment Status: Base Year and Follow-Up Percentages (1-, 2-, and 3-year Cohorts Combined) 56

10. Other Illicit Drug Use in Past 30 Days by Student/Employment Status: Base Year and Follow-Up Percentages (1-, 2-, and 3-year Cohorts Combined) 57

8

ACKNOWLEDGEMENTS

The authors thank Pamela Kittel, whose assistance in preparing this paper included data analysis, graphics preparation, table development, editing, and supervision of manuscript preparation. We also thank Duane Alwin for his helpful comments on and suggestions for the appendix on estimates of reliability.

ABSTRACT

Changes in Drug Use after High School as a Function of Role Status and Social Environment

Relatively little longitudinal research exists on the progression of drug-using behaviors through the early adult years, a period during which young people make a number of important transitions in social environments, primary activity, and marital status. The present paper, which is based on analyses of data from the national study, Monitoring the Future, presents findings from panel analyses covering intervals up to three years past high school. Shifts in the use of cigarettes, alcohol, marijuana, and other illicit drugs are first described for various groups defined in terms of living/marital situation, student status, and employment status. Regression analyses are then presented to disentangle the overlapping effects of these different experiences. The additional explanatory power of other sets of variables, some measured in high school and some measured after, is then assessed, including prior use of other drugs, demographic and background characteristics, and selected lifestyle dimensions (in high school and later).

Results of the analyses indicate that post-high school drug use is highly predictable from senior year drug use. The use of alcohol, marijuana, and other illicit drugs (but not cigarettes) seems also to be influenced by post-high school "living arrangements." More specifically, living with a spouse seems to reduce drug use, living with parents tends to continue the senior year status quo, living with a partner tends (mostly) to increase drug use, and other living arrangements (which include dormitories) also tend to increase use. These relationships are largely unaffected by the inclusion of other predictor dimensions.

INTRODUCTION

The recent rise in drug use among young people is a matter of considerable theoretical interest as well as public concern. The concern, of course, centers around the possible consequences of drug use, including long-term health hazards, more immediate risks of injury to self or others while drug-impaired, and a variety of other psychosocial disfunctions—for example, what has been termed the "amotivational syndrome" (National Institute on Drug Abuse, 1980). From a theoretical standpoint, however, youthful drug use behaviors are especially interesting because they seem to be highly sensitive to social influences including peer behaviors in "party" situations and other settings, as well as strong and often conflicting norms and pressures from parents and peers (Kandel, 1978; Johnston, Bachman, & O'Malley, 1981).

Among contemporary youth, the initial experience with any form of "recreational" drug use nearly always takes place in some sort of peer setting. Indeed, drug use is strongly correlated with use by friends (Johnston, 1973; Kandel, 1978; Akers, Krohn, Lanza-Kaduce, & Radosevich, 1979; Kandel, 1973); and longitudinal studies have shown that associating with users of a drug is predictive of an individual's subsequent initiation into use of that drug (Jessor & Jessor, 1978; Kandel, Kessler, & Margulies, 1978). Moreover, social contexts play important roles in the continuing use of drugs. Although cigarette use quite often leads to addiction, and small minorities of young people become addicted or habituated to use of other drugs, among the large majority of young people the most popular forms of drug use such as drinking alcohol and smoking marijuana remain in the category of occasional behaviors which are heavily dependent on immediate situational factors. For example, we have reported elsewhere that "to have a good time with my friends" is one of the reasons most commonly cited by users of a number of substances (Bachman, Johnston, & O'Malley, 1981a; Johnston, Bachman, & O'Malley, 1982). Accordingly, we can expect recreational drug use among youth to vary as a function of a variety of social factors; further, we can expect changes in social environments to have important impacts on such drug use.

In the present paper we explore some of the ways in which drug use among young adults seems to be shaped by different social environments and role responsibilities experienced in the first several years beyond high school. Three important and interrelated dimensions of post-high school experience are examined here: education, occupation, and living arrangements.

The transitions occurring after high school tend to be some of the most dramatic ones in the life-cycle: leaving the parental home, marrying and establishing one's own household, shifting from a predominantly educational environment to the world of work or homemaking, and so on. Cross sectional studies can tell us something about differences in substance use which exist after these transitions into new social environments and social roles; however, there remains the familiar problem of determining whether such differences reflect self-selection rather than the impacts of new social environments and roles. Thus Kandel, in a recent review of the literature, concluded that "Longitudinal follow-ups of cohorts in adulthood are needed in order to establish the connection between illicit drug use and participation in social roles" (1980, p. 275). The present paper provides early findings from longitudinal research focused specifically on that period of transition into early adult roles.

Given our focus on drug use behaviors during this developmental period, it is worth noting the complex, and in some respects contradictory, ways in which drug use appears related to the adult world. Among adolescents, especially early adolescents, the use of drugs may be identified with older and thus more "adult" people. Indeed, one aspect of what the Jessors (1977) treat as "problem behavior" among youth involves doing adult things (e.g., drinking alcohol, having sexual intercourse) prematurely. Such behaviors by youth might well be described as a mimicking of adult behavior. But in several other respects, the use of illicit drugs, or the excessive use of licit ones, clearly represents something counter to adult norms. Thus Kaplan (1978) treats drug use as one of the ways in which young people who are not successful according to conventional adult norms (e.g., doing well in school) can express their rebellion against such norms. Survey findings also show that the overwhelming majority of high school seniors perceive drug use as something their parents clearly oppose (Johnston, Bachman, & O'Malley, 1981). Moreover, a recent analysis of the correlates of drug use among high school seniors found three strong and consistent predictors: truancy, frequent evenings away from home, and low involvement in religion (Bachman, Johnston, & O'Malley, 1981b). Each of the above behaviors can be viewed as a means of reducing the direct influence of an adult-run-institution—i.e., the school, the home, and the church.

In balance, we are led to the view that adult role responsibilities, and also close ongoing relationships with adults (e.g., parents, coworkers, supervisors), are likely to have an inhibiting effect on drug use.* That general proposition is the basis for several specific hypotheses about the effects of post-high school role experiences. (In stating these hypotheses, we shall focus on relative changes. We thus temporarily set aside the question of whether overall rates of drug use increase, decrease, or remain stable during the first few years after high school. This important but complicated issue will be addressed in our presentation and discussion of results.)

Living Arrangements/Marital Status. Compared with drug use at the end of high school, we hypothesize that drug use during the years following will tend to be:

1. decreased among those in the "adult" role of living with a spouse;

2. relatively unchanged among those still living with their parents; and

3. increased among those living in dormitories or other arrangements involving few older adults.

The hypothesis that rates of drug use will be lowest among married people is consistent with findings from several other studies (Bachman, O'Malley, & Johnston, 1978; Henley & Adams, 1973; Robins, 1974; Clayton & Voss, 1977).

Another fairly common living arrangement among young adults is cohabitation with a partner of the opposite sex. While this arrangement is obviously similar to marriage in some respects, it is quite different in other respects (e.g., degree of commitment to the role and, perhaps, degree of association with married couples). Accordingly, it is difficult to arrive at a clear hypothesis concerning changes in drug use for those who make the transition into cohabitation during the first years after high school. On the other hand, given the still rather deviant nature of this living arrangement in contemporary American society, we hypothesize that individuals who select themselves into this counter-normative role status after high school will have displayed higher than average counter-normative behavior—including drug use—during high school as well as afterward. This hypothesis is consistent with evidence from one national study of young men in the mid-1970's which found that those cohabiting with women, unmarried, had higher rates of drug use than those in any other marital status (O'Donnell, Voss, Clayton, Slatin, & Room, 1976; Clayton & Voss, 1977).

---

*The presumed intervening processes, which we are not able to address here, include (a) a heightened degree of self identification as an "adult" expected to behave in the culturally prescribed manner, and (b) a reduced likelihood of associating with people who use drugs themselves and who accept/encourage use by others.

Employment Experiences. One commonly held hypothesis is that unemployment experiences tend to increase drug use. This follows not only from the fact that the unemployed are excluded from the adult role experience of employment, but also from the fact that they are subject to feelings of frustration and depression. Kandel's recent review of the literature led her to conclude that "Findings pertaining to labor force participation are among the most consistent. The unemployed have the highest rates of use of most drugs. . . " (1980, p. 249).*

Educational Experiences. For many young people, the strictly academic experiences associated with post-high school education do not represent a dramatic departure from their experiences in high school. Accordingly, we are disposed not to offer hypotheses about changes in drug use as a direct result of post-high school educational roles. This disposition is reinforced by the fact that our own prior research did not reveal clear shifts in drug use linked to educational attainment (Bachman, O'Malley, & Johnston, 1978). It is important to recognize, however, that the most important role transition for many who go on to post-high school education involves changes in living arrangements—moving out of the parental home, and perhaps into a dormitory. Further, those in full-time post-high school education are relatively unlikely to experience simultaneously the role of full-time "adult" employment. In other words, educational experiences are heavily confounded with living arrangements and employment experiences.

In sum, we are examining three important dimensions of post-high school experience as they impact on drug use. Our present longitudinal analysis traces drug use patterns from the senior year in high school to points one, two, and three years later. We note briefly some trends in overall levels of drug use, and we give careful attention to estimating the stability of various types of drug use as individual behaviors. Our primary focus, however, is upon the ways in which changes in drug use can be attributed to post-high school living arrangements/marital status, occupational experiences, and educational experiences. As indicated above, these three dimensions are not independent of each other. Accordingly, the most important phase of our analysis examines their effects jointly using a series of multiple regression analyses.

---

*Within the employment experience, one might speculate that drug use is more likely to be inhibited among those in "adult jobs" as opposed to those in "youth jobs," such as working at a fast food restaurant (see Greenberger & Steinberg, 1981, for a discussion of this distinction); however, it is beyond the scope of the present data and analyses to operationalize that distinction.

METHODS

Overview of Research Design

The design of the Monitoring the Future project has been described extensively by Bachman & Johnston (1978); see also Johnston, Bachman, & O'Malley (1982), and Johnston, Bachman, & O'Malley (1979). A description of sampling and data collection procedures is included as Appendix A of this report, thus only the key features of the research design are presented here.

The Monitoring the Future project employs what has been termed a cohort-sequential research design (Schaie, 1965; Labouvie, 1976) consisting of (a) a series of annual, nationwide questionnaire surveys of seniors in high schools, which began with the class of 1975, and (b) annual follow-up surveys mailed to subsets of each sample during the years following graduation.

Base-Year Data Collections from Seniors. The base-year data collection each year takes place in approximately 115 public high schools and 15 private high schools, selected according to a multi-stage procedure (Kish, 1965) as follows: Stage 1 is the selection of particular geographic areas, Stage 2 is the selection of one or more high schools in each area, and Stage 3 is the selection of seniors within each high school. This procedure results in an area probability sample of the 48 coterminous states, with numbers of cases ranging from about 16,000 to more than 18,000.

Base-year data are collected by questionnaires administered in classrooms during a normal class period, although circumstances in some schools require larger group administrations. The administrations are conducted by locally-based Institute for Social Research representatives and their assistants, following carefully standardized procedures.

Follow-Up Data Collections. For reasons of cost and sampling efficiency, only a portion of each base-year (i.e., senior class) sample is selected to be included in follow-up data collections. From each senior class two separate subgroups are sampled, each numbering approximately 1200 participants. Members of one subgroup are invited to participate in follow-ups one, three, five, seven, and nine years after graduation; those in the other subgroup are invited to participate in follow-ups two, four, six, eight, and ten years after graduation. (See Appendix A for details on the sampling procedures for follow-up data collections.) This alternating subsample approach means that follow-up data are available from some members of each graduating class on every follow-up year; however, individual follow-up participants are surveyed only on an every-other-year basis.

Follow-up questionnaires are sent by certified mail, along with a check for five dollars from the University of Michigan. This approach, coupled with reminders by mail and telephone when necessary, yields a response rate of about 80 percent or better.

(It should be noted that this follow-up procedure was first adopted in 1978. The previous two follow-ups, which did not involve payment to respondents, suffered much lower response rates. Accordingly, the present analysis is based only on follow-up data collected in 1978 and later.)

Accuracy and Representativeness of Findings

Depending on the year, from 66 to 80 percent of schools invited to participate in the Monitoring the Future project have agreed to do so. Whenever a school refuses, a similar school (in terms of size, geographic area, and urbanicity) is recruited as a replacement. The reasons for a school refusing to participate are varied; only a small proportion specifically object to the drug content of the survey. It thus seems reasonable to conclude that school refusals have not seriously biased the surveys.

Completed questionnaires were obtained from 77 to 83 percent of all sampled students each year. Explicit refusals to complete the questionnaires are infrequent; it is estimated that they represent only about 1 percent of the target sample. A much more important factor limiting the student response rate is absence from class at the time of data collection. Kandel (1975) found that students with high absentee rates had higher than average rates of drug use; and in the current study, among all students who did complete questionnaires, those who reported high rates of absenteeism also reported above average rates of drug use.

The samples used in longitudinal panel studies are subject to attrition over time and resulting biases. In the present study, follow-up response rates have averaged above 80 percent for periods up to five years beyond high school, a high rate of success for a survey employing mailed questionnaires. Nevertheless, there is some tendency toward poorer response rates among those with above-average drug use during high school. As a result, drug use rates for the retained samples in the present analyses modestly underestimate rates for all high school graduates (as shown in the Results section).

In sum,the samples underlying this report are limited to those who reached the end of the senior year of high school; students who were frequently absent are somewhat underrepresented; and heavier drug users are somewhat underrepresented in the follow-up responses. Each of these characteristics of the obtained longitudinal samples has the effect of underestimating overall drug use within the total age cohort; therefore, overall levels of use reported here should be interpreted as underestimates of the actual rates of use among all young adults. Since our focus in this analysis is on differential changes rather than on overall levels of use, we do not judge the above biases to represent a serious problem.

Another factor influencing the accuracy of our findings is the validity of our measures of drug use. A good deal of inferential evidence for the validity of the self-report measures of drug use employed in the present research has been summarized elsewhere (Bachman, O'Malley, & Johnston, 1979; Johnston, Bachman, & O'Malley, 1981). Further evidence relating to reliability, and to construct validity, is provided in the present paper. However, there is also clear evidence that reported drug use over relatively short intervals such as one month is systematically greater than would be inferred from self-reports for longer time intervals such as one year, a discrepancy which we interpret to be the result primarily of underreporting drug use over the longer time intervals (Bachman & O'Malley, 1981). It is relevant for the present longitudinal analyses to note that the discrepancy pattern appears to just about the same degree in follow-up surveys as in the senior-year surveys. Here again, the problem is moderated by the fact that we are focusing on differential changes rather than estimating exact levels of use.

Analysis Strategy

The Monitoring the Future research design is rich in possibilities for complex analyses. But at this stage of our longitudinal explorations we place a premium on clarity and simplicity, and this has influenced our choice of subgroups, measures, and analysis techniques. In particular, the specification of panels for longitudinal analyses was influenced by the following considerations:

1. We preferred to focus on follow-up data collected from 1978 onward. As noted in the preceding section, new follow-up procedures were introduced in 1978 which resulted in substantially improved response rates. Thus, by restricting our panel analyses to those involving 1978 and later follow-ups, we reduce the problems of panel attrition. Moreover, we largely eliminate problems of *differential* panel attrition, since the follow-up response rates from 1978 onward do not differ substantially by cohort or by number of years elapsed since graduation.

2. We elected to constitute panels in terms of a single follow-up (plus base-year, of course). It would be possible to examine two follow-ups plus base-year—for example, the class of 1976 and/or 1977 followed up in 1978 and again in 1980 (recall that follow-up participation is on an every-other-year basis, so different sets of individuals from these classes were followed in 1979). In fact, we have already carried out a few such multiple follow-up explorations. But the complexities of such analyses can easily become overwhelming; instead of a variety of combinations of roles and environments at one follow-up point, we would be dealing with all such combinations across two follow-up points—a geometric increase in the number of potential analysis subgroups, with many having only a few cases (and thus unreliable data). Accordingly, our primary approach in this paper is to rely on the simplest form of panel analysis: an initial base-year or "before" measurement, plus one follow-up or "after" measure.

3. The panel analyses are limited to those respondents who participated in the relevant follow-up data collection. High school drug use was slightly above average among those base-year respondents who were sampled for the follow-up but failed to participate. This means that our panel analyses include a small bias in the direction of underestimating drug use. But the bias is small (as documented later), because the proportion of nonrespondents is low and because their differences in initial levels of drug use were also fairly small. Since our primary focus in the present analyses is upon *changes* in drug use as related to different roles and environments, slight distortions in overall *levels* of use do not represent a serious problem.

4. The numbers of respondents in any given follow-up cohort are relatively modest; some of the roles and environments involve only small proportions of respondents; and many of the analyses in this paper are carried out separately for males and females. Given these considerations, it quickly became clear that we would have to combine a number of different cohorts in order to have sufficient cases in our various analysis subgroups. The nature of the combinations is outlined below.

Specification of Panels for Analyses. Figure 1 provides a summary of the various base-year plus follow-up panels that are used in the analyses described here. As the figure indicates, there are three separate panels which cover a three-year interval from base-year to follow-up (the classes of 1975, 76, and 77 resurveyed in 1978, 79, and 80, respectively). Similarly, there are three separate two-year panels, and three separate one-year panels. For analysis purposes we found it useful to combine all three-year panels, which can then be characterized as covering the interval 1976 to 1979, plus-or-minus one year. Similar combinations of all two-year and all one-year panels are displayed in the figure.

Although the one-year, two-year, and three-year panels all have the same follow-up dates (1978, 79, and 80), the actual respondents are non-overlapping (with only one exception, discussed below). Since different subsets of base-year respondents are sampled for odd-numbered and even-numbered follow-up years, the two-year panels can have no respondents in common with the one-year or three-year panels. And, of course, the three-year panels drawn from the graduating classes of 1975 and 1976 have no overlap with the one-year panels drawn from the classes of 1977, 78, and 79. But the follow-up sample from the class of 1977 does contribute twice: the 1978 follow-up provides a one-year panel, and the 1980 follow-up provides a three-year panel. It is very important to recognize, however, that when we characterize respondents according to their follow-up roles and environments there are many shifts in classification. Thus, for example, most members of the class of 1977 who were married by 1980 had not been married by 1978. And, of course, the drug use data for the 1978 follow-up differ from the drug use data for the 1980 follow-up. We elected to maintain the symmetry of our panel specification, as shown in Figure 1, even though that required a "double use" of the base-year 1977 data. However, as a check against any distortion, we replicated key analyses with the class of 1977 used only once. The results clearly indicated that no distortion was caused by the use of the 1977 class for both one-year and three-year follow-up panels.*

As Figure 1 indicates, if we combine all of the panels we can characterize the follow-up interval as two years plus-or-minus one, covering the period from 1975-79 to 1978-80. For most analysis purposes it has been feasible and preferable to conduct analyses using all panels combined.

Specification of Variables and Analysis Methods. As indicated earlier, our purpose in the present analyses is to explore the impact of various post-high school roles and environments upon drug use. Given that purpose, a fairly straightforward analysis strategy is to classify respondents according to those post-high school roles and environments, and then examine their post-high school drug use while taking account of any differences in base-year (high school senior) levels of drug use. One simple and often quite instructive way of taking account of base-year differences is to plot base-year and follow-up percentages in the form of trend lines for various subgroups, with the subgroupings determined by post-high school roles and environments. Another approach is to include base-year drug use scores in multiple regression analyses. Both of these methods are employed in the present paper. The measures of post-high school roles and environments, and of base-year and follow-up drug use, are described in the following sections. Additionally, data concerning reliability and stability of the drug use measures are presented early in the Results section (see Table 5).

---

*The replication was carried out by identifying two random halves of the class of 1977, and then deleting the 1977-78 data for one half and the 1977-80 data for the other half, which reduced the weighted N by about 700. Means and correlations involving all variables in Tables 7-11 were computed for this reduced sample and then compared with means and correlations for the full sample. No mean score difference exceeded .006 of a standard deviation, and no correlation difference exceeded .013. The comparisons involving the 45 correlations based on all pairings of five base-year and five follow-up drug use measures revealed no difference larger than .008, and the great majority of differences were smaller than .005.

Measures of Post-High School Role Status and Environment. Although the dimensions of post-high school roles and environments are many and complexly overlapping, we have found it useful to concentrate on just three key dimensions: student status, employment status, and living environment/marital status.

Student status was measured by a follow-up question asking, "During March of this year, were you taking courses at any school or college?" Table 1 summarizes responses to this question, shown separately for males and females in the one-year, two-year, and three-year panels. A majority of the respondents were taking some courses, most as full-time students. The proportions of part-time students are small, and exploratory analyses indicated that the distinction according to less than half-time versus half-time or more would be of little value in the present analyses. (The subgroups were too small, and there were no consistent differences in drug use between the two part-time student categories.) Accordingly, throughout this paper we will deal with just three categories of student status during (or immediately preceding) the follow-up data collection: full-time student, part-time student, not a student.

Employment status was measured by the follow-up question reproduced below:

> The next questions ask about your employment during the first full week in March. If you were on vacation from work that week, answer for the week before your vacation.
>
> Which BEST describes your employment during the first full week in March?
>
> 1. Two or more different jobs
> 2. One full-time job
> 3. One part-time job
> 4. Full-time homemaker (no outside job)
> 5. Laid-off or waiting to start a job
> 6. No paid employment at all that week

For present purposes, the first two categories were combined and treated as full-time employment, and the last two categories were combined and treated as representing no employment. Of course, it clearly means something quite different to have no employment if one is a student than if one is not; therefore, the measure of student status was taken into account so as to form the category described as "unemployed, and not a student," meaning that the person was neither a full-time nor part-time student. Several additional adjustments to the measure of employment status were made. The full-time homemaker category was restricted to females only, since the handful of males (0.1 percent) who checked that response alternative were far too few to analyze separately. The full-time employment group was further subdivided into those in civilian jobs, and those who indicated that their primary job in early March was military service. The full-time military job category was used for males, but the proportion of females (0.7 percent) was too small to permit analysis; accordingly, those females—along with the male homemakers—were placed in the residual "All Others" category (i.e., they were not included in the category of females in full-time civilian jobs). The resulting measure of employment status used in the present analyses is presented in Table 2, along with the percentage distributions of respondents.

Living environment/marital status was measured primarily in terms of responses to the following question: "With whom did you live during March?" A respondent who checked "my husband/wife" was characterized as living with spouse (no matter whether also living with parents, spouse's parents, etc.). A respondent could also be classified according to whether he/she lived with his/her own children; however, the numbers of cases were not sufficiently large, nor were the findings from preliminary analyses sufficiently distinct, to warrant a separate category for such respondents at this stage of our analyses. Another category which did prove important and distinct from others consists of those respondents indicating they lived with "my partner of the opposite sex." The largest specific category consists of those respondents who indicated they lived with their parents. While several other distinctions were possible based on responses to the question, including a distinction between living with others and living alone, we found such distinctions to be not sufficiently clear (e.g., a student living "alone" in a dormitory) and in any case not consistently important in our preliminary analyses. Accordingly, our measure of living environment consists of four categories, coded in such a way as to be mutually exclusive (e.g., a respondent was placed in the first applicable category, as ordered below):

1. Living with spouse
2. Living with partner
3. Living with parent(s)
4. All other living arrangements

One further distinction was made in some of our analyses, although it was clearly confounded with student status: those living in dormitories were sometimes treated as a category separate from the remainder of those in the fourth category above. Another distinction which was examined in some exploratory analyses, but not included in the present paper, involved those who lived on a military base. (This was, of course, heavily confounded with military employment; however, it also included some respondents living with spouses and some living with parents, and thus was judged too complicated for present purposes.)

The percentages of respondents in the four major living environments, plus those living in dormitories, are shown in Table 3.

Tables 1, 2, and 3 above provide percentage distributions separately for males and females in the one-year, two-year, and three-year panels. It may be worth mentioning some differences in distributions according to sex and number of years beyond high school, although such differences are all consistent with expectations. As the number of years beyond high school increases, the proportion of students decreases somewhat, and the proportion of respondents living with a spouse or with a partner increases substantially. Sex differences in proportions of students are not large, but there are distinctly higher proportions of females than males who live with a spouse or partner. (We have already noted, of course, the sex differences in military service and full-time homemaker roles.) The above differences are important, and they are part of the reason for conducting most analyses separately for males and females; nevertheless, we shall see that the basic findings for the two sexes are parallel, and do not seem affected by the different proportions noted above.

Measures of Drug Use. The measures of drug use employed in this paper have been discussed at some length in the fifth paper in this series (Bachman, O'Malley, and Johnston, 1979); thus, a brief description will be sufficient for present purposes.

Cigarette use in the past month was measured by a single item asking about use during the past 30 days. The response categories and codes are as follows:

1. Not at all
2. Less than one cigarette per day
3. One to five cigarettes per day
4. About one-half pack per day
5. About one pack per day
6. About one and one-half packs per day
7. Two packs or more per day

Instances of heavy drinking were measured by the following item:

> Think back over the LAST TWO WEEKS. How many times have you had five or more drinks in a row? (A "drink" is a glass of wine, a bottle of beer, a shot glass of liquor, or a mixed drink.)

1. None
2. Once
3. Twice
4. Three to five times
5. Six to nine times
6. Ten or more times

Alcohol use during the past year was measured using a composite based on reported use during the past 12 months and (for those with more than 40 uses during the year) use during the past 30 days. The code categories are as follows:

2. No use during last 12 months
3. Used 1-2 times during last 12 months
4. Used 3-5 times during last 12 months
5. Used 6-9 times during last 12 months
6. Used 10-19 times during last 12 months
7. Used 20-39 times during last 12 months
8. Used 40 or more times during last 12 months, but fewer than 10 times during last month
9. Used 40 or more times during last 12 months, and 10-19 times during last month
10. Used 40 or more times during last 12 months, and 20-39 times during last month
11. Used 40 or more times during last month

Note that there is no code numbered 1. This is because other versions of this composite scale make a distinction between no use during lifetime (coded 1), and use during lifetime but not during last year (coded 2). For present purposes it is more appropriate to limit our analysis to use during the past year; therefore, all respondents with no use during the past year are coded 2 (see Bachman, O'Malley, & Johnston, 1979).

Marijuana use during the past year is measured and coded in the same manner as alcohol use, described immediately above.

Other illicit drug use during the past year was measured using a series of questions dealing with the following illicit drugs: LSD, other psychedelics, cocaine, amphetamines, tranquilizers, methaqualone, barbiturates, heroin, and other narcotics. When appropriate, it was specified that the questions concerned use "...on your own—that is, without a doctor telling you to take them." (See Johnston, Bachman, & O'Malley, 1979, for the complete question stems.) The following coding was used.*

2. No use of the above illicit drugs during the last 12 months
3. Some, but no more than two, uses of any of the above drugs, except heroin, during the last 12 months
4. Three or more uses of at least one of the above drugs, except heroin, during the last 12 months
5. Any use of heroin during the last 12 months

Additional measures of drug use, selected specifically to provide percentages for graphic displays, include the following:

Use of a half pack or more of cigarettes per day;
One or more instances of heavy drinking (five or more drinks in a row) during the past two weeks;
Any use of marijuana during the past 30 days
Any use of other illicit drugs (see list of drugs in previous paragraph) during the past 30 days.

---

*This coding is a revision of the illicit drug use measure which distinguished between use of marijuana only (coded 2) and no illicit drug use (coded 1). For present purposes, all non-drug users are also coded 2, thus providing a measure of other illicit drug use.

RESULTS

Our examination of change in drug use begins by documenting the degree of overall increase or decrease in each type of drug use during the first few years beyond high school. We also present estimates of relative stability—the extent to which an individual's use or non-use in high school is likely to continue in the after high school years. Following this overview of change and stability for the sample as a whole, we examine differential patterns of change associated with particular post-high school living environments and student/employment/homemaker status. Because these several dimensions of post-high school experience are closely interrelated and thus potentially overlapping in their effects, the final step is to employ multiple regression analysis as a means of sorting out and interpreting their relative importance.

An Overview of Change and Stability in Drug Use

Overall Shifts in Levels of Drug Use. Table 4 shows percentage distributions, mean scores, and overall changes (gains) for each of the five measures of drug use, presented separately for males and females. For illustrative purposes, the data in this particular table are limited to the graduating class of 1977, followed up in 1978, 1979, and 1980.

As noted earlier, it is important in longitudinal analyses to control for panel attrition effects. Accordingly, Table 4 includes four different sets of senior year data for the class of 1977 (shown separately for males and females): First, for overall comparison purposes, data are shown for the full sample of seniors surveyed in 1977. Additionally, data are presented for those class of 1977 seniors who were selected and actually participated in the 1978, 1979, and 1980 follow-ups. (The reader may note that the base-year data which match the 1978 and 1980 follow-ups are quite similar; this is the case because, except for the few who participated in 1978 but not in 1980, the individuals—and thus their 1977 data—are identical. The base-year data for those followed up in 1979 are in some cases a bit discrepant from the other two base-year sets; this occurs because different subsamples are selected for odd-numbered and even-numbered follow-up years.)

In addition to the relatively minor (and essentially random) differences in distributions of base-year scores corresponding to the three follow-up groups, there are somewhat larger and consistent differences between these base-year distributions and those for the total sample of seniors in 1977. This reflects the bias noted earlier: those who as seniors were above average in their use of cigarettes, alcohol, and illicit drugs were slightly less likely to respond to follow-up surveys. The data in Table 4 document that bias, and also serve to indicate that it is rather small, especially among females. Nevertheless, because of that bias, and also because of the (smaller) random variations among the follow-up subsamples, we will find it most useful to focus primarily on the gain scores which appear in Table 4, since these largely correct for differences in base-year "starting points."

Beginning with the data in Table 4 for cigarette use, we observe only very slight overall increases during the first years after high school. Females show an increase in mean cigarette use of .12 (.08 of a standard deviation) one year beyond high school, and by three years the gain is .25 (.17 of a standard deviation). Cigarette use by males also gains a bit, but the increases are even smaller than those shown by females. It is interesting to note that the large proportion reporting no use of cigarettes is virtually identical between senior year and follow-up years. The changes in overall amount of smoking occur primarily because some young people have stepped up their dosage following high school. Thus, pack-a-day or higher levels of smoking are reported by 18 percent of males three years after high school, in contrast to 11 percent among senior males; and for females the pack-a-day or higher percentage nearly doubles from 9 percent as seniors to 17 percent three years later. In other words, while the increases in smoking are quite small when expressed in terms of the total sample (the majority of whom are non-smokers), when we focus our attention on the higher (and more hazardous) levels of smoking we observe substantial increases in the proportions of young adults who cross the pack-a-day threshold.

Turning to alcohol use, we find that instances of heavy drinking (five or more drinks in a row) show no consistent overall gain among females during the first three years after high school, while among males there is a slight increase. The index of total alcohol use during the past year, on the other hand, shows a steady gain for males during each year following graduation. For females, there is some increase in the first year after high school, and relatively little gain thereafter. By the third year after high school, mean scores had risen by more than one scale point for males and by about two-thirds of a scale point for females. Put more concretely, the mean score for males during senior year corresponds to about 10-19 uses of alcohol during the year, whereas the mean annual figure three years following high school corresponds to about 20-39 uses. For females, use was lower during senior year, and then rose to a mean corresponding to about 10-19 uses. These overall rates of alcohol use among twenty-one-year-olds seem fairly moderate, although the proportions who report daily or near daily use represent about one eighth of all males. Furthermore, the high proportions reporting occasional bouts of heavy drinking indicate that some of the frequent drinkers among these young adults are also heavy drinkers.

Focusing next on marijuana use, we see a somewhat different pattern of gain than was seen for alcohol use. There is a modest increase for males (about half a scale point, or .17 standard deviation) in the first year after high school, and half as large an increase for females. But by three years after high school, the rate of marijuana use was not appreciably higher among males than in the first year after, and it had actually dropped back slightly among females. These shifts are all quite modest; moreover, they are complicated by period effects rather than simply reflecting age effects (see O'Malley, Bachman, & Johnston, 1982, for a discussion of these issues as they relate to Monitoring the Future data).

The index of other illicit drug use showed virtually no increase during the first year after high school for the class of 1977, followed by some modest increases in both the second and third years. Heroin use remained well under one percent for males and females in all follow-up years, but the proportions reporting three or more uses during the year of at least one of the other illicit drugs (except marijuana) increased from about one in seven or eight as seniors to one in four three years later.

In sum, the data from the class of 1977 show a moderate rise in overall consumption of alcohol among young men and women during the first few years following high school. Smaller increases are in evidence for use of cigarettes, marijuana, and other illicit drugs. It should be noted, however, that our comparisons of senior classes from 1975 through 1980 have revealed some shifts in usage rates for cigarettes, marijuana, and some of the other illicit drugs (Johnston, Bachman, & O'Malley, 1981); and other analyses of base-year and follow-up data suggest the presence of period effects (secular trends) in use of some of these substances. Accordingly, we present the material in Table 4 not as a representation of drug use following high school which can be generalized to all classes, but rather as background for the change analyses which follow.

Stability in Relative Ordering of Drug Use Scores. Reported above is one perspective on change or stability—the extent to which mean levels of drug use (or percentage distributions) shift or remain the same during the first few years following high school. Apart from any overall shifts, however, it is of considerable importance to know whether the particular individuals who reported frequent use of a given drug during high school continue to rank among the frequent users of that drug in the following years. Table 5, based on the full set of panel data described earlier (see Figure 1), indicates that there are fairly strong correlations between drug use during high school and use of the same category of drug during the first several years after high school. As might be expected, these autocorrelations grow progressively lower as the interval increases from one to three years following graduation.

The highest autocorrelations in Table 5 appear for cigarette smoking, next highest for use of alcohol and use of marijuana, and lowest for use of other illicit drugs and for instances of heavy drinking during the past two weeks. The high autocorrelations for cigarette smoking were expected, given that the behavior is highly addictive. The much lower autocorrelations for the measure of other illicit drug use, and especially for the measure of instances of heavy drinking, might be expected at least partly on the basis of measurement limitations. The measure of other illicit drug use shows a substantial majority in the "no use" category, with most of the rest split between the next two categories. It is, in short, a somewhat rough measure. (We expect in future analyses to undertake more detailed examinations of a number of the specific categories of other illicit drugs.) The chief problem with the measure of instances of heavy drinking is that it is limited to the past two weeks. Our purpose in stating the question in that form was to avoid memory losses which occur over longer intervals (see Bachman and O'Malley, 1981); however, as a measure for characterizing individuals, it is limited. Specifically, there are limitations in the reliability of the behavior sample (in addition to any errors in the respondents' reporting of the behavior). In other words, there may be fairly stable individual differences in propensity to consume five or more drinks in a row, but asking about only the past two weeks may fail to capture much of those individual differences.

Fortunately, it is possible to make estimates of random measurement error (whether due to respondent error or due to the unreliability of the behavior sample). We have undertaken such estimates, and the underlying logic and procedures are detailed in Appendix B. Although we expect our work in this area to continue and result in some further refinement of our estimates, we are confident (a) that the present estimates come reasonably close to what our later and more refined estimates will be, and (b) that the incorporation of such estimates provides a much more realistic picture of the actual degree of individual-level stability of various types of drug use. The parenthetical entries in Table 5 provide stability estimates—i.e., autocorrelations adjusted for reliability—for the one-year, two-year, and three-year intervals beyond high school. The picture that emerges is a rather high order of stability along all of the drug use dimensions. Cigarette use remains the most stable, with an estimated correlation of .79 between senior year smoking and smoking three years later. The estimates for the other four dimensions shown in Table 5 are strikingly similar; they fall in a range from .80 to .85 for the one-year interval, and .58 to .67 for the three-year interval.

The implications of the above findings for any analyses of change would seem to be that post-high school experiences are likely to show only moderate differential effects on drug use of most young adults, since that behavior is already highly predictable from their drug use patterns in high school.

"Before and After" Drug Use Levels Related to Post-High School Role Status and Social Environment

In the analyses which follow we have found it useful to combine the one-year, two-year, and three-year panels. This has the effect of greatly simplifying our presentation by cutting down on the number of tables and figures to be displayed, and also by reducing the amount of random error (because the number of cases for a given figure or table is approximately tripled). We feel that relatively little is lost in this simplification, a point which may be clearer if we provide an illustration. Figure 2 displays trends in monthly marijuana use for male and female subgroups defined according to their living environment (which incorporates marital status). One-year, two-year, and three-year panel data are shown separately. Given the limited number of cases involved, especially for males living with a spouse in the first year or two beyond high school, it is not surprising that the three time intervals do not replicate each other perfectly. Nevertheless, they do show a good deal of consistency. For example, it is clear that for each interval, and for both males and females, young adults living with a spouse showed a decline in percentage reporting marijuana use during the past month, whereas those living with neither spouse nor parents (nor partner) showed an increased proportion of marijuana users. (The figure does not include data for those living with a partner of the opposite sex, since the numbers of cases in this category were too limited.)

The decision to combine panels was reached only after extensive examination of tables and figures of the sort illustrated in Figure 2. Those examinations revealed that while the proportions of young adults in particular categories of post-high school roles and environments shifted from one year to three years (see Tables 1, 2, and 3), the nature of the change in drug use is highly consistent across them.

The format for presenting data illustrated in Figure 2, when simplified by combining the three sets of panels, provides a fairly straightforward means for launching our exploration of the impacts of selected post-high school role statuses and social environments. We apply this basically descriptive approach to four dimensions of drug use, presented in the form of percentages who have reported a given level of drug use within the past month (or two weeks, in the case of the measure of heavy drinking).

Living Arrangements/Marital Role Status. Figure 3 presents the percentages of males and females who smoked a half pack a day or more of cigarettes at the time of the base year (senior year) survey and the follow-up survey (one to three years later), shown separately for the four living environments. An examination of this figure reveals several important findings:

1. For young adults in all four types of living arrangements there is some rise in percentage of half-pack-a-day (or more) smokers. This is consistent with the earlier observation based on Table 4. Examination of other data indicate that the overall upward trend shown in Figure 3 reflects the "escalation" of smoking rates by some previously lighter smokers (rather than non-smokers).

2. There are no very substantial subgroup differences in the nature of the changes observed for various subgroups in Figure 3, though there are some modest differences in rates of change. Females living with a spouse, for example, showed a change which was trivially small; and those living with partners showed the greatest increase. However, the figure indicates that living environments overall have relatively little differential impact on smoking rates during the first few years after high school.

3. Although the subgroups do not show large differential changes in rates of smoking, there are noteworthy overall (and relatively stable) differences in levels of smoking. As we shall observe later, these differences reflect two fairly general tendencies. First, those who (eventually) choose to live with a partner of the opposite sex outside of marriage show above-average involvement in all types of substance use, both before and after high school graduation. Second, those roles or living situations which are correlated with educational activities tend to reflect some of the drug usage differences known to correlate with educational aspirations and past academic performance—in particular cigarette use (see Bachman, O'Malley, & Johnston, 1978; Bachman, Johnston, & O'Malley, 1981b; Johnston, Bachman, & O'Malley, 1979, 1981). In the present data college students are less likely to be married or living with a partner, and more likely to be in "other" living arrangements, including dormitories.

Figures 4, 5, and 6 present, for respondents grouped according to living environment, "before and after" percentages for the measures of heavy (or "binge" or "party") drinking, marijuana use, and other illicit drug use. There is a considerable degree of similarity in the findings for all three of these drug use dimensions; thus we have chosen to discuss them together. The figures indicate the following patterns of findings:

1. Among those living with a spouse, the percentage reporting each type of drug use drops to a level substantially lower than that reported during the senior year of high school. This holds true for both males and females.

2. Among those in "other" living arrangements—i.e., not living with a spouse, a partner, or parents—drug use percentages increase substantially above the levels for the senior year of high school. Again, this holds for males and females, across all three drug use dimensions.

3. Among those living with parents, percentages reporting drug use remain generally similar to those for the senior year. (For the use of other illicits there is a very slight rise for both sexes, and for males there is some increase in binge drinking.)

4. The trend patterns for these three groups—those living with parents, with spouse, or the "others"—show quite clearly a divergence in use during the first few years after high school, depending upon which of the three living arrangements is in effect at the time of follow-up. During senior year of high school, when virtually all

respondents were living with parents (or guardians), there were few systematic differences in drug use relating to later entrance into different living arrangements; in other words, the trend lines tend to have rather similar starting points. Thus it is not possible to attribute the different patterns of shift to initial differences, since no such differences were clearly and consistently present.

5. Finally, those who reported living with a partner of the opposite sex showed consistently higher percentages of drug use as seniors; and, with only one exception (instances of heavy drinking among females living with a partner), their levels remained the highest after high school.

In sum, the descriptive data presented in Figures 4, 5, and 6 suggest that living with a spouse has a tendency to lower rates of drug use, living with parents tends to maintain the "status quo," and other living arrangements (including living with a partner of the opposite sex) facilitate a rise in drug use beyond the levels attained in the senior year of high school. These patterns seem rather consistent, as a whole, across use of alcohol, marijuana, and other illicit drugs. Moreover, as we report below, these effects are not "explained away" when a number of other relevant factors are controlled through the use of multiple regression analyses.

Student/Employment/Homemaker Status. It is a relatively simple matter to focus specifically on living arrangements, as we did in the preceding section; it is a much more complicated matter to examine either student role or employment role among young people just after high school, since the two dimensions are closely interrelated. Thus, for example, a full-time student has a low (but not zero) likelihood of also being fully employed. To take a different example, most of those not employed in the civilian work force or the military are not best described as "unemployed," since some are full-time homemakers and many are full-time (or at least part-time) students. As noted earlier, our measure of employment status specifically takes account of this latter problem by defining a group as unemployed and not a student or full-time homemaker.

The regression analyses reported later in this paper can take account of the overlap problems illustrated above. For present purposes, however, we found it useful to combine student and employment status into a single categorical variable. In the assignment of individuals to categories first priority was given to full-time or part-time student status, because extensive preliminary analyses indicated that this would result in the clearest and most straightforward representation. (Thus, for example, the small number of respondents who were both full-time students and full-time employees gave drug use reports which were similar to other full-time students.) Those who were neither full-time nor part-time students at the follow-up were categorized according to the measure of employment status (see Table 2).

It should be noted also that the combined measure of student/employment status is also correlated with post-high school living arrangements. Most obviously, the full-time homemaker category consists almost entirely of females living with spouse (although only about 30 percent of all female respondents living with spouse were categorized as full-time homemakers). Additionally, those who are full-time students during the first few years beyond high school are less likely than average to be living with parents, or to be married and living with a spouse, or to be living with a partner of the opposite sex; the students are more likely than average to be in the "other" living arrangements category, which includes those in dormitories.

Figure 7 displays "before and after" percentages of cigarette smokers (half-pack-a-day or more) for each category in the measure of student/employment/homemaker status. (In order to provide some additional clarity, heavier trend lines have been drawn for the two largest subgroups, full-time students and full-time employees in the civilian work force.) Here, as in Figure 3, we see some rise in percentages within most of the subgroups, and there is little evidence of differential change. The three subgroups which show little or no increase in percentage of half-pack-a-day smoking are all small (none over three percent of the total sample). Moreover, they show little consistency: the category of males in part-time jobs (and not students) shows no increase in percentage of smokers, but the corresponding category for females does; the category of unemployed females shows no appreciable increase, but that category for males does. The finding that homemakers do not show an increase in smoking does match the finding for all females living with a spouse, shown in Figure 3.

One other observation based on Figure 7 is also consistent with Figure 3; there are important (and relatively stable) subgroup differences in percentages involved in smoking. Among males, full-time students are only half as likely as part-time students, and only one-third as likely as non-students, to smoke a half-pack or more of cigarettes per day. The relationship is nearly as strong among females. But the figure also shows clearly that these differences are not the result of differences in post-high school student status, since these differences are clearly in evidence for the high school senior year (base year) reports of smoking.

Turning to Figures 8, 9, and 10, which relate student/employment/homemaker status to the other drug use dimensions, we find a more complicated picture than that for cigarette use. Listed below are a number of observations based on these three figures. We begin with those patterns which appear for all three drugs, and then turn to those which may involve only one or two of the drug use categories.

1. The highest percentage gains in drug use are shown by the full-time students, a finding which holds true for both males' and females' reports of heavy or "binge" drinking, marijuana use, and use of other illicit drugs. This rise could in some respects be described as a "catching up," since it is also the case that those who became full-time students after graduating from high school were among the lowest in average drug use during high school.

2. Those in full-time civilian jobs show little or no increase in percent of users, the greatest shift being only four percent (males' use of other illicit drugs). However, this group started at a relatively high level on all drugs.

3. It comes as no surprise, given our earlier findings, that those in the full-time homemaker category show a drop in use—a substantial drop in the case of marijuana and the other illicit drugs. The patterns are highly similar to the trends shown for all females living with spouses (see Figures 4, 5, and 6); therefore, it appears that there is nothing specific to the homemaker role which produces the shift, but rather the fact that the homemakers are a subset of those females who live with a spouse.

4. Contrary to expectations based on earlier research, we failed to obtain clear evidence that those in the unemployed (and not a student) category have "turned to drugs." The percentages of unemployed males using marijuana, or using other illicit drugs, are actually lower than when these same individuals were seniors

in high school; among females the percentage also drops slightly for marijuana use and shows no change for use of other illicits. Percentages of unemployed reporting instances of "binge" drinking have not shifted appreciably from the percentages when they were seniors. There are, however, further and more complicated findings concerning unemployment; these are reported later in this Results section.

5. Males in military service present a mixture of drug use trends. The percentage reporting one or more instances of "binge" drinking within the past two weeks rose just as substantially as did the percentage for full-time students (and it began from a slightly higher senior year percentage). The percentage of males in the military reporting marijuana use in the past month is only slightly higher than was the case for this group when they were seniors in high school, but the overall level is higher than for any other group (see Figure 9). The use of other illicit drugs, on the other hand, is relatively low among this sample of young men in military service—at a level unchanged from senior year.

Regression Analyses Examining the Impact of Post-High School Experiences

The preceding section took a fairly descriptive approach to reporting some of the ways in which drug use is associated with different post-high school experiences. We saw not only the extent to which subgroups differed in trends, but also the ways in which they differed in starting and ending points. In this section we concentrate more specifically on the analysis of change.

Our objectives in this stage of analysis are to isolate and quantify possible "effects" of various post-high school roles/statuses on drug use, and to examine the extent to which such effects are overlapping. A further objective is to clarify the predictive importance of (a) earlier use of drugs other than the focal drug, and (b) other background and lifestyle factors measured during the senior year. Another more secondary objective is to present some initial exploration of the relationship between certain other post-high school experiences and post-high school drug use.

Our approach in this section is to rely on multiple regression analysis. A number of methodological judgments and decisions were required in order to follow this approach, some of which are summarized below:

1. The dependent variables in these analyses are the five measures of drug use described in the Methods section. In other words, each analysis step is carried out five separate times, once for each of the five dependent variables. Note that here we use the full range of available scores, treated as interval scales (whereas in the preceding section we used dichotomous versions in order to permit figures scaled in percentages).

2. The three primary dimensions of post-high school roles/statuses are each analyzed as a set of dummy variables, thereby avoiding any constraint that the relationships with drug use (or other variables) be linear.

3. Other variables included in some analyses are described when introduced. Whenever appropriate, such variables are treated as interval scales; others are analyzed as sets of dummy variables.

4. The multiple regression analyses reported here include only additive effects; we conducted extensive explorations designed to discover interactions, and none of any consequence was found.

5. The analyses reported here are presented for males and females combined. The preceding analyses displayed some important differences between males and females in overall percentages reporting drug use, most notably the percentages reporting instances of "binge" drinking; but those analyses also showed few sex differences in trends. After conducting extensive regression analyses separately for males and females, we concluded that combining sexes for these analyses produces substantial gains in simplicity, some gain in precision, and no loss of relevant information. But after making that decision, we conducted still further tests to ensure that no important interaction was overlooked. Thus, for example, we found that a pattern variable (actually, a set of dummy variables) permitting all interactions between sex and the four-category measure of living environment produced no better prediction of post-high school drug use than was obtained when the two measures were entered separately (and thus non-interactively) in a regression analysis. (In both approaches the base-year score on the relevant dimension of drug use was also entered as a predictor; when repeated across the five drug use dependent variables, the gain in R^2 attributable to interaction was in no case as large as .002.) This and many other analyses leave us confident that no important interactive effects involving sex are being overlooked in the present analyses.

6. We noted earlier in this Results section that adjustments for measurement reliability can make a substantial difference in the interpretations of change and stability of drug use, particularly for a dimension such as our measure of "binge" drinking during the past two weeks. Since we believe that adjustments for measurement reliability provide a more accurate picture of "reality," we have included such adjustments in the present analyses. On the other hand, we recognize also that such adjustments are in some respects arbitrary and subject to dispute. Accordingly, we also provide a parallel reporting of relationships in their unadjusted version. (Fortunately, our basic conclusions about whether any relationship exists are the same no matter which version of the data we use; however, interpretations of the strength of relationship are in some instances substantially different.) The adjustments for measurement reliability are limited to the five dimensions of drug use (both senior-year and follow-up measures); the reliability estimates are those shown in Table 5 and discussed at length in Appendix B. We are fairly comfortable about assuming perfect reliability (i.e., making no adjustment) for the dimensions of post-high school roles/statuses; we think the reliability in reporting such things as whether one is living with a spouse or with parents is very close to 1.0, and thus any adjustment would be too small to make an appreciable difference. On the other hand, we do recognize that some of the measures introduced in the later (and more secondary) stages of these analyses might well be adjusted for reliability. Such an effort is beyond the scope of the present analysis, but may well be included in future analyses which place a greater emphasis on these other variables.

7. The correlation matrix underlying the regression analyses is presented in Appendix C; specifically, the version presented is unadjusted for reliability. (Any interested reader, of course, may undertake to replicate any of the regression analyses, and/or carry out new ones, using whatever assumptions about reliability are preferred.)

First Set of Regressions: Controlling Base-Year Use of Drug. We begin this series of regression analyses with a relatively simple question, and one which follows fairly directly from the "before and after" analyses in the preceding section: How much variance in each of the post-high school drug use measures can be explained by each of the measures of post-high school role status and social environment, with base-year use of that drug controlled?

The answer to that question, and to other questions which follow, can be obtained from Table 6. The table summarizes a series of multiple regression analyses using various combinations of predictors. Columns A through S in the table each indicate a set of predictors (shown by the Xs in the upper portion) and also the multiple-R^2 values for that set of variables predicting to each of the five post-high school drug use dependent variables. The multiple-R^2 values are reported in two versions; the upper entry involves no adjustment for reliability, while the lower entry is based on a revised correlation matrix in which correlations with all base-year and follow-up drug use measures are adjusted upward to account for estimated reliability (see table notes and Appendix B).

Column A in Table 6 shows the variance in post-high school drug use which can be explained when the base-year (high school senior year) score on the same drug use dimension is used as the predictor. (There is a close correspondence with the data presented earlier in Table 5, except that now the findings are shown for all three time intervals—one year, two years, and three years—combined.) Column B adds sex as a predictor, which results in an increase in variance explained (using the values adjusted for reliability) of .016 (i.e., 1.6%) for the measure of "binge" drinking; less than a one percent increase in prediction of annual use of alcohol, marijuana, and other illicit drugs; and no impact whatever on predictability of cigarette use. The fact that sex makes only a small marginal contribution to prediction of "binge" drinking, for example, does not necessarily mean the sex differences are small; in this case it means that the substantial sex differences are equally evident in senior year drinking data, and thus there is only a small increment in prediction when sex is added to the equation.

Returning now to the question stated a bit earlier, we can see that a comparison of Column C with Column B will show the increment in prediction attributable to post-high school living arrangements/marital role status. There is virtually no effect on smoking (consistent with observations based on Figure 3), but for the other dimensions of post-high school drug use the effects of living arrangements are appreciable—an additional two to three percent of variance explained.

Comparing Column D with Column B shows the marginal contribution of student status. Again there is virtually no effect on cigarette use, while for the remaining drug use dimensions the increment in explained variance is small—a bit less than one percent of total variance. The story is very similar for the measure of employment status, as indicated by a comparison of Column E with Column B.

In sum, when each of the three measures of post-high school role status and social environment is added to base-year drug use and sex as predictors, it makes some marginal contribution to explained variance in post-high school alcohol use, marijuana use, and use of other illicit drugs. The effects attributable to living arrangements are two to three times larger than those attributable either to student status or to employment status.

Given that there is a considerable overlap among the three post-high school role dimensions, as discussed earlier, and given that the dimension of living arrangements seems to be the more important predictor of post-high school drug use, a second question arises: Do the student status and employment status dimensions make any contribution to explained variance once living arrangements have been taken into account? The answer, found by comparing the R^2 values in Column F (which includes all three predictors) with the values in Column C (which includes only living arrangements), is that the dimensions representing student and employment roles add very little in explained variance. The largest increment is 0.4 percent for other illicit drug use, while for the other drug use dimensions the increment is 0.3 percent or smaller.

It can be argued, of course, that it is "unfair" to place one variable ahead of others in this sort of "stepwise" procedure. But if we turn the procedure around the other way—comparing Columns D and F, and Columns E and F—we find a very different sort of answer. The fact remains that living arrangements is the only one of the three dimensions that can do just about as good a job as all three together can—at least when it comes to predicting changes in drug use during the first years after high school.

Given that we have now taken a close look at the three predictor dimensions of greatest interest to us, we can take a moment to consider another question which is partly substantive and partly methodological: After controlling for differences in post-high school role dimensions, are there any differences in post-high school drug use linked to year of graduation (1975 through 1979) and/or to number of years beyond high school (one to three)? Comparing Columns G, H, and I each with Column F shows no such effects for smoking or "binge" drinking, a small effect (0.5 percent increment in explained variance) of years beyond high school on annual alcohol use, and small effects (0.5 percent) of year of graduation on use of marijuana and use of other illicit drugs.* More specifically, alcohol use is slightly greater for those age 21 than for those age 19, while use of illicit drugs is slightly greater among those who graduated from later high school classes. Neither of these effects is very large, and this is reassuring from a methodological standpoint given our decision to combine respondents across several ages and graduating classes. Nevertheless, the analysis does reveal some subtle differences, which are the subject of much more extensive exploration in another report (see O'Malley, Bachman, & Johnston, 1982).

Second Set of Regressions: Adding Further Base-Year Predictors. Our analyses thus far have taken a very simple approach to predicting "change" in drug use—we have included the base-year score on the same dimension of drug use which is the dependent variable. It can be argued, however, that the analyses should also take into consideration other prior factors which might be predictive of post-high school drug use. The next set of regression analyses deals with several sets of such factors.

---

*Recall that our earlier analysis (shown in Table 4) revealed some increase in overall amount of smoking between senior year and the first year beyond high school, with little further increase thereafter. This is fully consistent with our present finding of no differential age effect comparing those one, two, and three years after graduation.

The first and most obvious question in this section is: *After predicting post-high school drug use from senior year use of that same category of drug, is there further predictability to be gained by including other dimensions of senior year drug use in the equation?* The answers to the question are based on comparisons of Columns J and B (both of which also include sex as a predictor, although that turns out to make no appreciable difference). Post-high school cigarette use is highly predictable from senior year cigarette use, and senior year use of other drugs adds virtually nothing to that prediction. A very different picture emerges for the measure of other illicit drug use; by adding other senior year drug use measures to the senior year measure of other illicit drug use, we can increase explained variance by about six percent (the increase would be ten percent if we were not using adjustments for reliability). For the measure of marijuana use, the increment in predictability is only about one percent. The measure of "binge" drinking shows little added predictability when other senior year drug measures were added to the equation (although the story is quite different for the data unadjusted for reliability). The other measure of alcohol use does show some increase in predictability—about three percent.

Earlier analyses which concentrated on correlates of senior year drug use (see Bachman, O'Malley, & Johnston, 1980; Bachman, Johnston, & O'Malley, 1981b) revealed a number of background and lifestyle factors which predicted (or, more accurately, correlated with) senior year drug use. This suggests a further question to be addressed in the present series of regression analyses: *Do factors of background and senior year lifestyle make any additional contribution to explaining post-high school drug use, once prior drug use is controlled?* The answers are based on a comparison of Columns K, L, and M with Column J. For none of the dependent variables does the set of background and senior year lifestyle measures add as much as one percent of additional explained variance. (The specific variables included are listed in the notes to Table 6.) Some effects reach statistical significance; however, they are sufficiently small as to have little substantive value in the present line of analysis. (Incidentally, these small effects remain to some extent—about two-thirds—when the analysis includes post-high school role dimensions; the relevant data are contained in Columns N and O.) Thus, most of the effect of these background and lifestyle characteristics in high school on the use of various drugs after high school work via their effect on earlier drug use.

The above findings show that the inclusion of additional base-year data on use of other drugs, background, and lifestyle make some marginal improvement in the prediction of post-high school drug use. Now the more relevant question given the primary focus of this paper is this: *Do the effects of post-high school role status and social environments on drug use appear different (smaller) when more extensive controls for other senior-year factors are introduced?* In order to answer this question, we need to examine the differences between Columns M and O, compared with the differences between Columns F and B. The results of that examination need not be reproduced here; in general they indicate that the effects of post-high school role status and social environments remain, and are only slightly reduced by the introduction of the more extensive controls. The practical implication of this finding for the present investigation is that the examination using more limited controls remains valid. Thus, when we later take a more detailed look at some regression analysis results, it will be sufficient (and much more parsimonious) to concentrate on the simpler analyses using fewer predictors.

Third Set of Regressions: Brief Exploration of Other Post-High School Factors Potentially Related to Drug Use. This section of the paper represents a continuation of the sequence of regression analyses to other post-high school experiences, some of which fit fairly clearly within the scope of the present investigation, but others of which exceed that scope (and thus will be treated in only a preliminary fashion).

One dimension of post-high school environment which is certainly pervasive is the sort of area in which one resides. Accordingly, we included in some of the final regression analyses a measure which distinguishes between those living on farms, in rural areas, in small towns, large cities, suburbs, etc. A comparison between Columns P and O reveals that this additional information on current social environment can explain no more than 0.2 percent of additional variance in any of the post-high school drug use dimensions.

Another set of variables reflecting further post-high school experiences was included here primarily for exploratory purposes. All are closely related to the post-high school role statuses we have been examining. We wanted to determine if any of these conditions had large enough effects to overlap substantially with those reported earlier in this paper. A summary appraisal for the total set of these predictors is provided by comparing Column Q with Column P. For other illicit drugs the total addition to explained variance is 0.5 percent, for marijuana use it is 0.3 percent, and for the other dimensions it is smaller than 0.2 percent. Detailed examination of the standardized regression coefficients (betas) revealed a value of .07 (and a partial correlation coefficient of .09) between number of weeks unemployed and use of other illicit drugs. The corresponding relationships between weeks of unemployment and marijuana use are a beta of .03 and a partial correlation of .05. These relationships are quite small (though statistically significant). We have mentioned them here partly to show what were the largest of the set, but also to acknowledge that there is a bit of evidence suggesting a weak link between extended unemployment and drug use. We discuss that evidence at the end of this section on Results.

One other set of variables reflecting post-high school experiences shows some important relationships with drug use, but these relationships are difficult to place in any sort of presumed causal sequence. The set of four "lifestyle" dimensions—religious commitment, political views, frequency of evenings out, frequency of dating—which were found to be important predictors of senior year drug use, were also included in the follow-up data collections. Thus we are able to examine the association between post-high school drug use and post-high school lifestyle dimensions. The problem, of course, is that here, as was true also for the analyses limited to senior year data, we cannot with any confidence assert a single dominant direction of causation. For example, we cannot be sure whether changes in religious commitment lead to changes in drug use levels, or vice versa, or both. A comparison between Columns Q and R indicates some relatively substantial increments in variance "explained" when this set of four variables is added to the other predictors. Although it is beyond the scope of the present paper to resolve the issues raised by this additional step in the regression analyses, we felt it worth reporting as an indicator of other work which remains to be done.

Detailed Examination of First Set of Regressions. The reporting of multiple regression analysis results thus far has focused on overall variance explained (R^2 values), and on increments to explained variance (comparisons of R^2 values). Now we turn to a more detailed examination of the patterns of relationship revealed in the regression analyses. Since we have already established that the post-high school experiences of primary interest in this paper show basically the same impact on drug use whether or not a variety of other dimensions are included in the equation, we have found it simpler and more parsimonious to return to the first set of regression analyses for this detailed examination. Specifically, we will focus on the analyses summarized in Columns C and F of Table 6, which predict post-high school use of a given drug, employing the following predictors: senior year use of the same drug, sex, living arrangements, and (for the second regression analysis, but not the first) student status and employment status. We will thus be able to observe in some detail the patterns of prediction when living arrangements operate "alone" (i.e., apart from student status and employment status), and when all three variables appear together and thus are able to share those predictive relationships which are overlapping.

Tables 7 through 11 present the relevant data for the five dimensions of post-high school drug use. The findings for cigarettes, shown in Table 7, are fully consistent with our earlier observations that post-high school cigarette use is highly predictable from use during high school, and the introduction of other variables into the equation does not improve prediction.

The findings for both measures of alcohol use (Tables 8 and 9), marijuana use (Table 10), and use of other illicit drugs (Table 11) are so similar that we can discuss them together. The regression coefficients (B values) shown in the third column of each table confirm our earlier observations that living with a spouse tends to suppress post-high school drug use, whereas moving out of the parental home into "other" living arrangement (i.e., not with a spouse or partner) is associated with greater than average increases in drug use. As noted earlier, the "other living arrangements" category includes a substantial number of students, many of whom are living in dormitories. (Recall that extensive examination of the dormitory group as a separate category revealed that their trends in drug use were not different from other students not living with a spouse, partner, or parents; thus a separate dormitory category was not used in the final stages of analysis.) Living with a partner shows a slightly positive effect on post-high school use of alcohol (but not on "binge" drinking), and fairly substantial positive effects on use of marijuana and other illicit drugs.

When student status and employment status are added to the regression equations, there is very little impact on the relationships discussed above. Moreover, as discussed earlier, there is no appreciable increase in prediction of any of the drug use dependent variables when we add the student and employment status measures as predictors. An examination of specific regression coefficients suggests some "sharing" of effects, and it may be worth noting the more important ones. There is a very slight tendency for full-time student status to contribute to greater than average increases in alcohol use (both measures). Our inclination is to interpret that as reflecting the fact that students are somewhat less likely than others to be living with spouses or parents. A similar finding for alcohol use among males in military service can be interpreted in much the same way. Full-time homemakers show a tendency to decrease use of alcohol and marijuana after high school, a relationship which clearly overlaps very closely with the "living with spouse" effect.

In sum, this more detailed examination of regression analyses seems consistent with observations presented at several points earlier in the paper. Post-high school drug use is highly predictable from senior year drug use. The use of alcohol, marijuana, and other illicit drugs (but not cigarettes) seems also to be influenced by post-high school "living arrangements." More specifically, living with a spouse seems to reduce drug use, living with parents tends to continue the senior year status quo, living with a partner tends (mostly) to increase drug use, and other living arrangements (which include dormitories) also tend to increase use. The small relationships between drug use and student status, or employment status, seem largely interpretable in terms of these different living arrangements, with which they correlate.

Further Examination of the Impacts of Unemployment Experiences

Given some indication, albeit very weak, that the number of weeks of unemployment may be positively associated with drug use, we examined that relationship in greater detail. We computed the levels of both senior year drug use and follow-up drug use for those at each level of reported unemployment during the year prior to the follow-up survey. (The unemployment question in the follow-up survey asked for number of weeks of unemployment during the preceding calendar year—January through December—and provided the following response categories: None, 1-2 weeks, 3-4, 5-9, 10-14, 15-20, 21-26, 27 or more weeks.) We found some tendency for post-high school drug use to be lower than average among those who reported no unemployment; however, among those who reported any unemployment, there was no tendency for greater amounts of unemployment to be associated with greater amounts of drug use. If anything, there was some indication that those with highest amounts of unemployment had a bit less drug use than those with intermediate amounts of unemployment. The most important finding, however, was that senior year reports also showed lower than average drug use among those who would later report no unemployment. These patterns appeared basically the same for males and females, and were not substantially altered when we excluded full-time students and also blacks (the latter step was taken because blacks are above average in unemployment but report lower than average use of some drugs).

In sum, our analysis of the weeks of unemployment measure provided no clear indication that those with some amount of unemployment post-high school showed greater than average increases in drug use. These findings do not agree completely with the regression analyses reported above, nor do they coincide exactly with the "before-and-after" analyses reported early in this paper. The greatest consistency among these several unemployment analyses is that none of the relationships is very strong. We are, therefore, left with a somewhat frustrating lack of resolution. The possible impact of unemployment on drug use remains an important topic, and we intend to return to it with a more focused analysis covering a longer time interval after graduation. For present purposes, however, we must consider the matter unresolved.

DISCUSSION

Our examination of factors predicting drug use during the first years following high school has revealed two clear and consistent findings. First, the most important predictor of drug use following high school is drug use during high school. Indeed, the strength of correlation between senior year use and use one to three years later is impressively high, particularly after corrections for measurement error. A second clear finding is that various post-high school living arrangements lead to important shifts upward or downward in the use of alcohol and illicit drugs. For example, among those living with a spouse, the proportion reporting any instances of heavy drinking during the past two weeks is about 12 percent smaller than during the senior year, whereas among those living away from the parental home (but not with a spouse or partner of the opposite sex) the proportion is about 12 percent greater than during the senior year. Similar effects nearly as strong appear for use of marijuana during the past month, and for use of other illicit drugs during the past month. We discuss these and other findings in greater detail below, but first it is important to establish the extent to which our findings are valid, and how widely they can be generalized across time and across populations.

We are fairly confident of the validity and generality of these findings for a number of reasons. One reason is that the samples are relatively large, nationally representative, and have reasonably high response rates. We noted earlier that there are some biases in the obtained samples, and in the self-reports of drug use, which tend in the direction of modestly underestimating the overall amounts of drug use; nevertheless, our panel design and analysis approach largely controls these biases for purposes of assessing differential changes in use during the early post-high school years. It is possible, of course, that different relationships exist among the high school dropouts who were excluded from our sample; however, it seems more probable to us that the same basic relationships hold for this group as well, and that if our sample had extended to all young adults the findings would have remained the same.

No matter how accurately a sample represents a particular population at a given point in time, the issue remains as to how generalizable the findings are to other populations and/or times. As a number of authors have noted (e.g., Schaie, 1965; Baltes & Nesselroade, 1972; Ryder, 1965), conventional longitudinal designs can be confounded, and their results threatened with obsolescence, during periods of rapid cultural change. Marijuana use levels have increased dramatically during the past two decades; and there have also been important changes in the use of cigarettes, alcohol, and other drugs. Indeed, had our panel analyses of post-high school changes in drug use been conducted during the early nineteen-seventies, we would have found substantial increases in marijuana use for all—or nearly all—subgroups. But it would have been a mistake to attribute all of that upward shift to factors uniquely associated with the transition out of high school, or an increase in age, since analyses holding age constant show a similar sharp rise in marijuana use during the early and middle nineteen-seventies for all age groups under thirty-five (Fishburne, Abelson, & Cisin, 1980). On the other hand, a comparison of graduating high school classes since 1975 reveals a peak in senior year usage rates for both cigarettes (in 1976-77) and marijuana (in 1978-79), and no very large shifts for alcohol (Johnston, Bachman, & O'Malley, 1981). The fact that our present analysis happened to catch marijuana use at the crest of the wave rather than during a period of continuous rise may have served to simplify the job of reporting and interpreting results. A further simplification results from the fact that we did some amount of "averaging" across cohorts and time intervals (the classes of 1975 through 1979, followed up in 1978 through 1980, covering post high-school intervals from one to three years). The fact remains, however, that drug use has been particularly susceptible to secular trends, and that will probably continue to be the case. Thus we have preferred to speak of differential shifts in drug use as a function of post-high school environments, since overall directions of change are also influenced by secular trends. And while the overall patterns of use across an age span may be substantially affected by a secular trend taking place at that particular interval in history, we think it less likely that such secular trends would be specific to particular subgroups in the population (say, those who remain in the parental home), which is the only way that secular trends might cause misleading results in any analysis of differential subgroups shifts.

Our confidence in the generality of our findings on the impacts of living arrangements is strengthened not only by their replicability across three categories of drug use (alcohol, marijuana, and other illicit drugs), but also by the similarity of effects for males and females. Our data showed some sex differences in overall levels of drug use; however, the differential shifts in use as a function of different living arrangements were quite similar, as indicated in Figures 4 through 6. In particular, it is of interest to note that although more than twice as many females as males were married within two or three years after high school, the declining trend lines in drug use were remarkably parallel for married men and women.

Given the generalizability of these findings, it is important that we have solid grounds for causal interpretations based on the relationships between living arrangements and drug use. One key feature of the present study is that it employs longitudinal data as the basis for making such interpretations. In her recent review of drinking and drug use among youth, Kandel observed that "No systematic longitudinal analyses have yet been carried out in young adulthood to determine whether cessation of use follows or precedes entrance and exit from certain social roles" (1980, p. 249), and she pointed to the need for longitudinal studies to sort out such crucial questions. It should be acknowledged that longitudinal data do not always provide clear answers to such questions; the patterns of findings are sometimes quite ambiguous. Fortunately, the present findings concerning impacts of living arrangements are about as clear and straightforward as we could wish. The best example is provided by the trend lines for monthly marijuana use shown in Figure 5 (but see also the similar patterns in Figures 4 and 6). Looking first at only the follow-up (or "after") data in Figure 5, we see distinctly different percentages of marijuana users among those living with a spouse, those living with parents, those cohabiting with a partner, and those in still other living arrangements. If our information were limited to the follow-up data, we would remain uncertain about whether those differences reflect differential effects of the living arrangements, or simply longer-standing differences between those who enter these different situations. The availability of base-year (or "before") data clarifies matters. Among those who soon after graduation were cohabiting with a partner, half or more had as seniors reported some use of marijuana during the past month; this is consistent with the interpretation that the high rate of marijuana use for this subgroup preceded entrance into the social role of cohabitant. Among the three larger subgroups in Figure 5, however, the percentages of marijuana users at the end of high school were much lower; more important, the subgroup percentages were virtually identical. This close similarity at the end of high school, coupled with distinct differences we observed one to three years later, provide strong support for the interpretation that living arrangements do influence use of marijuana. To be sure, the pattern of diverging trend lines shown for the three major subgroups in Figure 5 does not require the causal interpretation offered here. But an alternative interpretation would require either the assumption of some set of predisposing factors which were present but fully masked during the senior year and only afterward came into play, or the assumption that changes in some other causal factors (like going to college) are confounded with the different living arrangements. The unmasking of pre-existing dispositions is hardly very parsimonious, and we think we have controlled for the most obvious confounded causal factors which change. Therefore, we conclude that the most plausible interpretation of the data is that post-high school living arrangements have an impact on drug use, and they do so in the ways hypothesized at the outset of this paper.*

Although our primary focus in this paper is on the impact of post-high school role status and social environment, a few additional words are in order about the other (and much stronger) finding reported—the finding that drug use at the end of high school is highly predictive of subsequent drug use. As discussed at some length in Appendix B, we do not interpret the strong correlation between earlier and later drug use as indicating simply that senior year drug use "causes" drug use one or two or three years later. Rather, we recognize that many of the factors which influence drug use—factors such as religious commitment, commitment to education, peer and family pressures, personal attitudes about drugs, and other aspects of lifestyle—all have a certain stability themselves. Thus, in a sense, our measure of senior year drug use is a convenient proxy for a wide array of more fundamental (and relatively stable) causes of drug use, some of which we have measured and many of which we have not. It should be recalled that our multiple regression analyses, which included prior drug use as predictors, revealed virtually no additional contribution of background factors and senior year lifestyle as predictors of post-high school drug use. It thus appears that senior year drug use is a rather good proxy for senior year background and lifestyle. An alternative interpretation would be that our measures of background and lifestyle are not very good; however, their success in other analyses (e.g., Bachman, Johnston, & O'Malley, 1981b) makes this interpretation less plausible. In any case, an important backdrop for our discussion of the impacts of post-high school roles and environments on drug use is the finding that drug use is largely predictable from a variety of prior factors, particularly those involved with earlier drug use.

Given that much of drug use after high school is predictable from senior year drug use, it remains important to understand those shifts in use which may be attributable to post-high school experiences. Our examination of three dimensions of such experiences revealed several fairly clear and straightforward relationships between living arrangements and the use of alcohol and illicit drugs; and it also revealed some smaller and less straightforward relationships between drug use and both student status and employment status. Some of the subgroup differences linked to student and employment status are illustrated in Figures 8 through 10. For example, the figures suggest that full-time students show somewhat larger than average increases in percentages of occasional (or more often) heavy drinkers, marijuana users, and users of other illicit drugs. It is also clear that females who are full-time homemakers show decreases in each of those percentages.

---

*Still other logical possibilities remain: For example, since our "before" and "after" drug use measures are separated by one to three years, one might suppose that shifts in drug use could occur soon after high school and then in turn affect living arrangements. But this interpretation would require that such differentiation into different patterns of drug use in nearly all cases "await" high school graduation. Moreover, since some marry soon after graduation, and many leave the parental home to enter college within just a few months, the shifts in usage would often have to occur very quickly after graduation. All that seems highly implausible.

How should such relationships be interpreted? Is there something about being a homemaker that tends to reduce use of drugs? Is there something about being a college student which tends to increase use? In the case of homemakers, all (or virtually all) are also living with a spouse; and we have seen that drug use declines for the overall category of individuals living with a spouse—not just homemakers. In the case of college students, one of the most important aspects of college life is that it often involves leaving the parental home and moving to a dormitory or other student housing situation; in addition, college students are less likely than their age-mates to be married and living with a spouse. Thus it is possible that the tendency for students to show greater than average increases in drug use may be due primarily to the different living and marital arrangements associated with being a student. The results of our regression analyses (see especially Tables 8 through 11) support that conclusion; the data strongly suggest that differential shifts in drug use correlated with differences in student and/or employment status are interpreted most parsimoniously as the effects of a more fundamental factor—differences in living/marital arrangements.

We think the above interpretation is plausible as well as parsimonious. Certainly it seems likely that for most high school graduates a change in living arrangement—specifically, moving out of the parental home—involves a major shift in lifestyle. Most notably, parental contacts and controls are greatly reduced. For those living with a spouse, another kind of social control is introduced; however, for those living alone or with others (not spouses) of a similar age, the effect in many cases is clearly to reduce inhibition. Can such a strong case be made for working—does graduating from high school and becoming a full-time employee involve equally important changes? We suspect that is not, in fact, the case. For those who are in the work force just one to three years after graduation from high school, the job experiences often are not dramatically different from those during high school. (In this connection it is worth noting that three-fourths of those in our samples were employed during their senior year, averaging 15 to 20 hours per week; thus most were already quite used to the experience of holding a job.) Similarly, much of the college experience may represent an extension of the high school experience—except, of course, that the living arrangements often change.

We have argued that among the three dimensions of role status and social environment we have examined, living arrangements (including marital status) have the greatest potential for dramatic change. A further reason why living arrangements should be more important than student and employment status, insofar as drug use is concerned, is simply that living arrangements bear much more directly on leisure time activities—and for most young adults the use of drugs (other than tobacco) is largely a leisure time activity.

Although the findings have confirmed our hypotheses with respect to the impacts of living arrangements/marital status, the same cannot be said concerning our hypotheses about the impacts of unemployment experiences. We had expected to find that unemployment leads to increased drug use. However, our "before-and-after" analyses provide no clear evidence of unemployment increasing drug use. Moreover, our regression analyses predicting post-high school drug use indicate that the employment and unemployment experiences make no additional contribution to explained variance once living arrangements/marital status are taken into account. The above observations apply to both a one-point measure of unemployment (first week of March) and a measure of number of weeks unemployed and seeking work during the past year (January through December). Given the present evidence, we are not able to conclude that the hypothesis about unemployment effects is supported. However, given the findings of other researchers cited earlier, and given some of the ambiguities in our own findings, we are also unwilling at present to assert that the hypothesis should be rejected. Instead, we plan to return to this particular issue with more detailed analyses employing a greater accumulation of panel data; specifically, we will in the future be able to analyze greater numbers of cases, longer time intervals, and multiple time points (rather than just "before" and "after").

Before ending this discussion of the impacts of post-high school experiences on drug use, it is worth recalling that we have dealt with a wide variety of drug using behaviors; and even though we have observed some strong parallels in the ways some of these behaviors seem to be affected by living arrangements, there are some important distinctions between drug categories which are reflected in our findings.

Cigarette use is in several respects the most distinctive of the drug use behaviors treated here. Certainly, it is by far the most widespread addictive behavior among young people, which helps to explain some of our longitudinal findings. For example, we found cigarette smoking to be the most stable of the drug using behaviors analyzed here; post-high school use is highly predictable from senior year smoking patterns (Table 5), and it shows no clear differential effects of post-high school experiences (Table 7, Figures 3 and 7). On the other hand, we did observe an overall increase in the amount of cigarette smoking coinciding with departure from high school, and that may represent a very general (rather than differential) effect of moving into post-high school environments. In the high school setting young people are constrained from smoking for substantial periods of time, whereas in the large majority of post-high school occupational and educational settings it is much more feasible and acceptable to take an occasional cigarette break. This simple reduction or removal of situational constraints may be largely responsible for the post-high school rise in smoking. One other noteworthy finding is that cigarette use is strongly (and negatively) correlated with post-high school education, even though it is not affected by it. As Figure 7 indicates, half-pack-a-day smoking was three times as frequent among males who were full-time employed as among those who were full-time students, and the relationship was nearly as strong for females. But as the figure also indicates, such differences were fully in evidence at the initial data collection at the end of high school; thus they seem not to result from later educational experiences. (On the other hand, earlier educational experiences, particularly experiences of failure, may have played some role in the initiation into smoking.)

Most of the other drug use treated in this paper is occasional behavior not prompted by a physiological dependence. Nevertheless, such use can often be characterized as problem behavior, particularly when it leads to impairment that can involve hazards for self and others (e.g., driving while intoxicated). Certainly one of the most common of such problem behaviors among young people is the consumption of excessive amounts of alcohol. Our measure of heavy drinking (five or more drinks in a row) suffers from some measurement unreliability, probably because it refers to a very limited period (the past two weeks); however, when adjustments are made for reliability it appears that this behavior pattern is fairly stable—to a considerable extent, the same individuals who sometimes drink heavily in high school are the ones who do so in the first few years after high school. It is encouraging to note that this particular pattern of alcohol use shows very little tendency to increase following graduation. We observed only a slight overall rise among males and none among females, in spite of the fact that purchasing alcohol became legal (or at least easier) for increasing proportions.

Total consumption of alcohol, in contrast to instances of heavy drinking, does increase during the years following high school. This is hardly surprising, since alcohol as an accompaniment to meals and at other social occasions is a widely accepted (and extensively advertised) social behavior. Our present measure of overall alcohol use during the past year includes both heavy and moderate use, and the results show a high degree of similarity in the impact of the post-high school variables on overall frequency of use (Table 9) and instances of heavy drinking (Table 8). An interesting area for future exploration might be moderate drinking (with those who sometimes drink heavily excluded from the analysis). The findings might be rather different from our present work focused primarily on drug use as problem behavior.

The remaining categories of drug use considered here fall fairly unambiguously under the heading of problem behaviors—at least as defined by much of the current adult world. The use of marijuana, and most of the other illicit drug use, is intended to produce an altered state of consciousness—to enable the user to "get high." These behaviors, and also heavy drinking, are the focus of most of the concern about youthful use of drugs.

Our present findings, as well as much other work, suggests that susceptibility to problem drug use increases throughout junior and senior high school (see Kandel, 1980, for a summary of the evidence). During the years that follow, problem drug use declines for most individuals; and we think this occurs largely as a consequence (both direct and indirect) of the assumption of adult responsibilities. Our present findings are certainly consistent with such an interpretation. We plan in future analyses to carry such explorations further into adulthood, thus providing additional evidence about the relationship between problem drug use and adult role experiences.

TABLES AND FIGURES

Table 1

Percentages of Follow-Up Respondents According to Student Status

Student Status	Number of Years Beyond High School:							
	Males				Females			
	1 Yr	2 Yrs	3 Yrs	Total	1 Yr	2 Yrs	3 Yrs	Total
Full-Time Student	54.2	48.6	38.7	47.7	53.0	42.0	35.9	44.4
Half-Time or More	3.6	2.7	3.5	3.3	3.1	4.2	3.0	3.5
Less Than Half-Time	3.2	4.9	5.7	4.5	4.5	4.1	4.5	4.4
Not A Student	39.0	43.8	52.1	44.6	39.3	49.7	56.5	47.8
	100.0	100.0	100.0	100.1	99.9	100.0	99.9	100.1
$N_{weighted}$	1002	927	833	2762	1183	1104	910	3196

Table 2

Percentages of Follow-Up Respondents in Various Employment Roles

Employment Role	Number of Years Beyond High School:							
	Males				Females			
	1 Yr	2 Yrs	3 Yrs	Total	1 Yr	2 Yrs	3 Yrs	Total
Full-Time Civilian Job	35.4	42.0	49.6	41.9	31.1	39.8	47.3	38.7
Full-Time Military Job	4.2	4.9	5.8	4.9	a	a	a	a
Full-Time Homemaker	b	b	b	b	4.0	6.6	5.6	5.3
Part-Time Job	24.3	22.4	17.4	21.6	25.6	24.7	19.8	23.7
Unemployed Non-Student	4.0	3.7	5.3	4.3	6.1	5.2	5.6	5.6
All Others	32.2	26.9	21.9	27.3	33.2	23.6	21.9	26.7
	100.1	99.9	100.0	100.0	100.0	99.9	100.2	100.0
$N_{weighted}$	1046	964	857	2866	1231	1143	941	3315

[a] Not tabulated for females; included in "All Others."

[b] Not tabulated for males; included in "All Others."

Table 3

Percentages of Follow-Up Respondents in Different Living Environments

Living Environment	Number of Years Beyond High School:							
	Males				Females			
	1 Yr	2 Yrs	3 Yrs	Total	1 Yr	2 Yrs	3 Yrs	Total
Living with Spouse	1.8	7.0	13.7	7.1	8.6	18.0	24.2	16.3
Living with Partner	1.6	3.6	4.0	3.0	3.7	5.4	5.9	4.9
Living with Parent(s)	56.0	48.5	39.2	48.5	53.9	45.3	34.7	45.5
All Other Arrangements	40.5	40.8	43.1	41.4	33.8	31.3	35.2	33.4
(Living in Dormitory)	(24.3)	(18.0)	(12.1)	(18.5)	(23.6)	(15.8)	(10.8)	(17.3)
(Not in Dormitory)	(16.2)	(22.8)	(31.0)	(22.9)	(10.2)	(15.5)	(24.4)	(16.1)
	99.9	99.9	100.0	100.0	100.0	100.0	100.0	100.1
$N_{weighted}$	1046	964	857	2866	1231	1143	941	3315

Table 4

Levels of Drug Use Reported by Base-Year and Follow-Up Respondents: Percentage Distributions, Means, Standard Deviations, and Gains (Class of 1977 followed up in 1978, 1979, 1980)

	Males							Females						
	Senior Year (1977)				Follow-Up			Senior Year (1977)				Follow-Up		
	Total Class	1st cohort	2nd cohort	3rd cohort	1st cohort (1978)	2nd cohort (1979)	3rd cohort (1980)	Total Class	1st cohort	2nd cohort	3rd cohort	1st cohort (1978)	2nd cohort (1979)	3rd cohort (1980)
Cigarette Use in Past Month														
1. Not at all	63.4	66.7	64.9	66.6	66.3	64.4	67.3	60.4	60.2	63.3	60.0	61.2	60.5	58.9
2. Less than 1 cig. per day	9.5	8.8	10.5	9.1	7.3	8.0	5.8	9.6	11.4	11.3	11.8	8.9	8.7	8.5
3. One to five cig. per day	7.5	6.7	5.5	6.4	6.7	2.2	5.0	11.1	9.5	8.6	9.8	6.1	8.4	6.4
4. About half-pack a day	8.5	6.0	8.9	6.5	5.1	8.4	3.7	9.6	9.8	8.0	9.3	9.6	8.9	9.0
5. About one pack a day	8.8	9.2	8.3	9.0	11.0	12.0	14.2	7.3	7.3	6.9	7.2	11.2	8.7	11.9
6. About one and one-half	2.0	1.7	1.7	1.6	3.2	3.6	3.7	1.6	1.4	1.4	1.5	2.1	3.8	4.1
7. Two packs or more	0.4	0.8	0.2	0.7	0.4	1.5	0.4	0.3	0.3	0.7	0.4	0.8	1.0	1.1
Mean	1.97	1.91	1.91	1.90	1.99	2.12	2.05	2.00	1.98	1.91	1.98	2.10	2.12	2.23
Standard Deviation	1.51	1.51	1.46	1.50	1.60	1.74	1.69	1.45	1.44	1.43	1.44	1.61	1.64	1.73
N (weighted)	7164	321	296	317	314	290	319	7713	392	394	368	380	382	358
Raw Gain (X - X)					+.08	+.21	+.15					+.12	+.21	+.25
Standardized Gain (Raw Gain/1.48)					+.05	+.14	+.10					+.08	+.14	+.17
Instances of Heavy Drinking														
1. None in last 2 weeks	50.0	56.9	50.8	56.7	48.7	45.4	47.2	70.7	69.0	73.1	67.7	67.9	66.8	68.9
2. One in last 2 weeks	12.5	11.0	15.3	10.8	15.9	16.8	15.6	10.9	12.5	9.1	13.2	14.0	14.4	12.1
3. Twice in last 2 weeks	12.0	10.6	12.3	11.2	10.5	12.5	12.8	7.7	7.7	6.1	8.2	8.1	10.3	10.5
4. Three to five times	15.6	14.0	12.6	14.2	19.6	18.9	17.1	7.3	7.7	7.7	8.0	6.2	6.2	5.6
5. Six to nine times	5.6	5.1	5.9	4.8	3.6	3.3	5.5	2.5	1.7	3.0	1.6	2.5	0.9	2.1
6. Ten or more times	4.2	2.3	3.2	2.3	1.8	3.1	1.9	1.0	1.3	1.0	1.2	1.3	1.4	0.8
Mean	2.27	2.07	2.17	2.06	2.19	2.27	2.24	1.63	1.65	1.61	1.66	1.65	1.64	1.63
Standard Deviation	1.53	1.44	1.47	1.43	1.40	1.44	1.42	1.15	1.15	1.17	1.15	1.15	1.09	1.10
N (weighted)	6838	313	284	307	323	290	316	7367	375	377	353	384	390	360
Raw Gain (X - X)					+.12	+.10	+.18					.00	+.03	-.03
Standardized Gain (Raw Gain/1.38)					+.09	+.07	+.13					.00	+.02	-.02

Table 4 (Continued)

	Males							Females						
	Senior Year (1977)				Follow-up			Senior Year (1977)				Follow-Up		
	Total Class	1st[a] cohort	2nd cohort	3rd cohort	1st cohort (1978)	2nd cohort (1979)	3rd cohort (1980)	Total Class	1st cohort	2nd cohort	3rd cohort	1st cohort (1978)	2nd cohort (1979)	3rd cohort (1980)
Alcohol Use in Past Year														
2. None in past year	10.1	9.0	12.9	8.6	7.2	7.4	5.8	15.8	13.1	16.9	12.9	9.2	8.6	10.0
3. Used 1-2 times	9.5	11.7	6.2	10.9	9.5	6.5	4.6	15.8	17.0	14.9	16.1	12.0	14.1	6.6
4. Used 3-5 times	10.4	14.5	11.6	15.1	6.4	7.4	5.6	12.8	13.0	12.9	12.1	11.3	12.4	12.9
5. Used 6-9 times	10.9	9.1	12.8	10.6	9.2	7.7	7.6	12.6	9.0	11.9	9.4	13.1	9.4	10.4
6. Used 10-19 times	15.8	17.7	15.9	16.7	16.5	14.3	14.2	16.3	18.4	15.8	19.8	16.0	17.2	19.0
7. Used 20-39 times	13.8	10.3	10.9	11.7	15.7	12.4	17.9	12.5	14.5	14.1	14.6	16.2	15.7	16.4
8. ≥40, <10 last month	10.8	11.5	11.6	10.0	15.4	17.7	18.5	5.7	5.2	5.1	5.6	10.6	9.9	9.7
9. ≥40, 10-19 last month	10.4	8.8	11.4	10.0	10.5	17.0	14.0	5.2	5.9	5.8	5.7	7.0	8.1	10.5
10. ≥40, 20-39 last month	4.0	4.1	3.0	3.4	6.6	5.5	8.2	2.4	2.9	2.1	2.7	3.1	3.7	3.0
11. ≥40 in last month	4.1	3.4	3.6	3.0	3.1	4.1	3.5	0.9	0.9	0.6	1.1	1.5	0.7	1.5
Mean	6.03	5.84	5.92	5.82	6.41	6.70	6.91	5.05	5.20	5.03	5.26	5.70	5.67	5.91
Standard Deviation	2.49	2.45	2.49	2.40	2.40	2.44	2.28	2.26	2.28	2.26	2.27	2.27	2.28	2.27
N (weighted)	6812	311	278	305	323	283	314	7291	369	376	348	373	375	354
Raw Gain ($X_{FU} - X_{BY}$)					+.57	+.78	+1.09					+.50	+.64	+.65
Standardized Gain (Raw Gain/2.42)[b]					+.24	+.32	+.45					+.21	+.26	+.27
Marijuana Use in Past Year														
2. None in past year	46.9	53.4	47.8	51.8	44.6	42.6	43.6	58.2	56.3	58.6	55.4	50.5	54.7	52.9
3. Used 1-2 times	9.4	8.6	11.8	9.5	9.3	6.5	10.0	8.4	9.8	10.7	10.0	10.4	8.9	9.1
4. Used 3-5 times	6.9	7.4	6.5	8.0	7.5	6.3	7.7	6.1	4.7	3.3	4.6	6.3	6.8	7.5
5. Used 6-9 times	5.2	4.4	2.6	4.2	5.8	6.4	4.2	4.9	5.3	5.3	5.4	5.9	5.3	6.5
6. Used 10-19 times	6.5	6.4	6.4	6.5	6.6	4.8	5.3	6.3	6.4	5.9	7.2	8.2	5.6	7.5
7. Used 20-39 times	5.5	3.3	6.1	3.0	5.5	4.0	6.8	5.7	7.8	5.8	7.5	6.9	4.7	4.2
8. ≥40, ,10 last month	3.1	1.9	2.8	2.0	3.3	6.4	5.3	2.2	1.9	2.2	2.0	1.8	2.7	3.6
9. ≥40, 10-19 last month	4.4	4.7	3.9	4.5	5.4	8.4	5.5	2.9	2.1	2.8	2.7	4.5	3.0	2.2
10. ≥40, 20-39 last month	5.2	5.6	6.2	6.0	5.9	7.3	7.5	2.9	3.1	3.1	3.0	2.5	4.0	3.8
11. ≥40 in last month	6.9	4.3	6.0	4.4	6.1	7.3	4.0	2.3	2.6	2.3	2.1	2.9	4.3	2.6
Mean	4.45	4.07	4.36	4.11	4.55	4.99	4.60	3.67	3.74	3.64	3.76	3.97	3.92	3.86
Standard Deviation	3.07	2.90	3.05	2.92	3.07	3.28	3.04	2.53	2.56	2.54	2.53	2.62	2.77	2.59
N (weighted)	7012	322	285	316	322	286	319	7536	384	390	361	381	392	359
Raw Gain					+.48	+.63	+.49					+.23	+.28	+.10
Standardized Gain (Raw Gain/2.83)[b]					+.17	+.22	+.17					+.08	+.10	+.04

Table 4 (Continued)

	Males							Females						
	Senior Year (1977)				Follow-Up			Senior Year (1977)				Follow-Up		
	Total Class	1st[a] cohort	2nd cohort	3rd cohort	1st cohort (1978)	2nd cohort (1979)	3rd cohort (1980)	Total Class	1st cohort	2nd cohort	3rd cohort	1st cohort (1978)	2nd cohort (1979)	3rd cohort (1980)
Other Illicit Drug Use in Past Year														
2. None	74.5	77.2	74.5	77.2	75.3	65.8	67.0	75.5	76.1	77.7	76.1	74.2	73.7	69.5
3. 1-2 uses if any*	9.4	9.3	10.5	8.7	9.9	11.8	6.6	9.2	8.4	8.6	8.2	9.6	9.2	7.7
4. 3 or more uses if any*	14.9	12.9	13.7	13.4	14.7	21.8	26.1	14.9	15.2	13.3	15.4	16.0	17.1	22.4
5. Any use of heroin	1.3	0.7	1.3	0.7	0.1	0.6	0.3	0.4	0.3	0.3	0.3	0.3	0.0	0.5
Mean	2.43	2.37	2.42	2.38	2.40	2.57	2.60	2.40	2.40	2.36	2.40	2.42	2.43	2.54
Standard Deviation	0.79	0.73	0.77	0.74	0.74	0.85	0.89	0.75	0.75	0.72	0.75	0.76	0.77	0.85
N (weighted)	7081	324	288	317	321	292	322	7599	388	391	365	386	397	359
Raw Gain ($X_{FU} - X_{BY}$)					+.03	+.15	+.22					+.02	+.07	+.14
Standardized Gain (Raw Gain/.77)					+.04	+.19	+.29					+.03	+.09	+.18

*Except heroin.

[a] Senior Year data for the 1st cohort is limited to the respondents who participated in the one-year follow-up. Similar restrictions apply to the 2nd (two-year follow-up) and 3rd (three-year follow-up) cohorts. Slight differences in the weighted N between the base-year and follow-up for each cohort are due to missing data on the particular drug use variable.

[b] The Standardized Gain utilizes the Standard Deviation based on the Total Class of 1977, calculated on data for males and females combined.

Table 5

Autocorrelations (Base-Year with Follow-Up) for Drug Use Measures

	Correlations Between Base-Year and:		
	1-Year Follow-Up	2-Year Follow-Up	3-Year Follow-Up
Cigarette Use in Past Month	.788	.732	.703
(adjusted, assuming reliability=.89)	(.89)	(.82)	(.79)
Heavy Drinking in Past 2 Weeks	.514	.462	.418
(adjusted, assuming reliability=.64)	(.80)	(.72)	(.65)
Alcohol Use in Past Year	.704	.650	.584
(adjusted, assuming reliability=.87)	(.81)	(.75)	(.67)
Marijuana Use in Past Year	.763	.656	.590
(adjusted, assuming reliability=.90)	(.85)	(.73)	(.66)
Other Illicit Drug Use in Past Year	.596	.479	.421
(adjusted, assuming reliability=.73)	(.82)	(.66)	(.58)

Table 8

Explained Variance Using Different Combinations of Base Year and Follow-Up Variables to Predict Follow-Up Use of Five Classes of Drugs: 1-, 2-and 3-year Cohorts Combined, BY75-79[a]

		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
Predictor Variables																				
Base Year Use of Same Drug as Dependent Variable		X	X	X	X	X	X	X	X	X										
Base Year Use of all Five Drug Classes[b]											X	X	X	X	X	X	X	X	X	X
Sex (Male/Female)			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Living Environment[c]				X			X	X	X	X					X	X	X	X	X	X
Student Status[d]					X		X	X	X	X					X	X	X	X	X	X
Employment Status[e]						X	X	X	X	X					X	X	X	X	X	X
Background[f]												X		X		X	X	X	X	X
Senior Year Lifestyle[g]													X	X		X	X	X	X	X
Post High School Lifestyle[h]																			X	X
Other Post High School Experience[i]																		X	X	X
Where R Living Now[j]																	X	X	X	X
Class Year (1975-1979)								X		X										X
Years Beyond High School (1,2,3)									X	X										X
Dependent Variables																				
Follow-Up Reporting of:																				
Cigarette Use in Past Month	R^2	.5496	.5496	.5513	.5521	.5524	.5558	.5560	.5562	.5562	.5522	.5536	.5529	.5541	.5579	.5589	.5595	.5607	.5645	.5649
(Adjusted for Reliab.)	R^2	.6938	.6938	.6956	.6948	.6955	.6984	.6986	.6989	.6989	.6952	.6960	.6958	.6965	.7000	.7008	.7016	.7027	.7069	.7072
Instances of Heavy Drinking	R^2	.2219	.2456	.2632	.2471	.2485	.2644	.2645	.2645	.2646	.3006	.3019	.3025	.3038	.3179	.3214	.3224	.3231	.3639	.3647
(Adjusted for Reliab.)	R^2	.5418	.5579	.5875	.5662	.5650	.5889	.5889	.5893	.5893	.5614	.5679	.5637	.5704	.5926	.5986	.6007	.6018	.6673	.6685
Alcohol Use in Past Year	R^2	.4241	.4348	.4595	.4407	.4426	.4620	.4639	.4658	.4658	.4375	.4466	.4420	.4512	.4648	.4756	.4779	.4799	.5196	.5234
(Adjusted for Reliab.)	R^2	.5603	.5694	.5965	.5776	.5787	.5994	.6018	.6041	.6042	.5993	.6030	.6023	.6062	.6229	.6279	.6301	.6319	.6716	.6762
Marijuana Use in Past Year	R^2	.4600	.4667	.4852	.4687	.4695	.4867	.4903	.4880	.4903	.4731	.4754	.4759	.4783	.4922	.4956	.4977	.5007	.5360	.5392
(Adjusted for Reliab.)	R^2	.5679	.5739	.5936	.5771	.5775	.5953	.6000	.5971	.6000	.5831	.5848	.5844	.5862	.6020	.6036	.6053	.6086	.6438	.6484
Other Illicit Drug Use in Past Year	R^2	.2523	.2541	.2690	.2541	.2571	.2736	.2736	.2754	.2772	.3538	.3568	.3564	.3593	.3677	.3724	.3733	.3776	.3920	.3965
(Adjusted for Reliab.)	R^2	.4735	.4756	.4952	.4769	.4790	.4992	.4992	.5024	.5047	.5369	.5390	.5389	.5410	.5556	.5587	.5597	.5647	.5840	.5904

Table 8

Explained Variance Using Different Combinations of Base Year and Follow-Up Variables to Predict Follow-Up Use of Five Classes of Drugs: 1-, 2-and 3-year Cohorts Combined, BY75-79[a]

Footnotes

[a] The one-year cohorts are (Senior Year/Follow-Up Year); 77/78, 78/79, and 79/80. The two-year cohorts are 76/78, 77/79, and 78/80; and the three-year cohorts are 75/78, 76/79, and 77/80.

[b] The five base year drug use variables consist of Cigarette Use, Heavy Drinking, Alcohol Use, Marijuana Use, and Other Illicit Drugs Use.

[c] Living Environment consists of 4 dummy variables: Living with Spouse, Living with Partner, Living with Parent*, and Living in Other Arrangements.

[d] Student Status consists of three dummy variables: Full-time Student, Part-Time Student, and Non-Students*.

[e] Employment Status consists of six dummy variables: Full-time Job, Part-Time Job, Unemployed (and not a student), Full-Time Military Job (for males only), Full-Time Homemaker (for females only), and Others*.

[f] Background items include Race, High School Grades, and Truancy.

[g] Senior Year Lifestyle includes Religious Commitment, Political Beliefs, Evenings Out for Recreation, and Frequency of Dating.

[h] Post High School Lifestyle measures include the items in the previous footnote measured in the follow-up data collection.

[i] Other Post High School Experiences include Number of Children, Number of Months Employed in Past Year, Earnings in Past Year, Percent of Financial Support for Self, Percent of Financial Support from Parents, and Number of Weeks Unemployed in Past Year.

[j] Where Respondent is Living Now consists of nine dummy variables: On a Farm, In the Country, In a Small City or Town (under 50,000 people)*, In a Medium-Sized City (50,000-100,000), In the Suburb of a Medium-Sized City, In a Large City (100,000-500,000), In a Suburb of a Large City, In a Very Large City (over 500,000), and in a Suburb of a Very Large City.

*The Dummy Variable representing this category was excluded from Regression Analyses.

Table 7

Monthly Use of Cigarettes (Follow-Up Measure Scaled 1-7) Predicted from Senior Year Cigarette Use, Sex, and Post-High School Role Status Measures

Predictors	Unadjusted r	Drug Use Measures Adjusted for Reliability[a]				
		r	B	beta	B	beta
Senior Year Use of Cigarettes in Past Month	.741	.833	.966	.833	.954	.823
Sex (M=1, F=2)	.020	.021	-.002	.000	.015	.005
Living environment*						
with spouse	.022	.023	-.107	-.021	-.157	-.031
with partner	.108	.114	.240	.029	.230	.028
with parent(s)*	.002	.002	*	*	*	*
all other arrangements	-.060	-.064	.063	.019	.117	.035
Student Status*						
full-time student	-.208	-.221			-.109	-.033
part-time student	.012	.012			.007	.001
non student*	.189	.200			*	*
Employment Status*						
full-time civilian job	.141	.150			.099	.030
part-time job	-.084	-.089			.037	.010
unemployed (and not student)	.052	.055			.084	.011
full-time military (males only)	.051	.054			.258	.024
full-time homemaker (females only)	.002	.002			.072	.007
all others*	-.121	-.128			*	*
Multiple Correlation Coefficients			R = R^2 =	.834 .696	R = R^2 =	.836 .698

[a] All statistics, except the unadjusted product-moment correlations displayed in the first column, are derived from a revised correlation matrix incorporating adjustments for reliability in the drug use measures. Adjusted entries, in addition to product-moment correlations (r), include unstandardized regression coefficients (B) and standardized regression coefficients (beta).

*Because dummy codings were used for this variable (with each category in turn coded 1 while all others are coded 0), one category from the variable had to be excluded from the regression analyses. The category indicated by the asterisk was chosen for exclusion.

Table 8

Instances of Heavy Drinking in Past Two Weeks (Follow-Up Measure Scaled 1-6) Predicted from Senior Year Heavy Drinking, Sex, and Post-High School Role Status Measures

Predictors	Unadjusted r	Drug Use Measures Adjusted for Reliability[a]				
		r	B	beta	B	beta
Senior Year Instances of Heavy Drinking	.471	.736	.697	.709	.701	.712
Sex (M=1, F=2)	-.244	-.305	-.270	-.105	-.258	-.100
Living environment*						
with spouse	-.146	-.182	-.420	-.106	-.408	-.103
with partner	.001	.001	-.142	-.022	-.148	-.023
with parent(s)*	-.010	-.013	*	*	*	*
all other arrangements	.108	.135	.287	.108	.253	.095
Student Status*						
full-time student	-.014	-.018			.119	.046
part-time student	-.019	-.023			-.019	-.004
non student*	.024	.030			*	*
Employment Status*						
full-time civilian job	.046	.058			.050	.019
part-time job	-.044	-.055			-.039	-.013
unemployed (and not student)	-.005	-.006			.088	.015
full-time military (males only)	.056	.070			.198	.023
full-time homemaker (females only)	-.085	-.106			.026	.003
all others*	.006	.007			*	*
Multiple Correlation Coefficients			R = R^2 =	.767 .588	R = R^2 =	.767 .589

[a] All statistics, except the unadjusted product-moment correlations displayed in the first column, are derived from a revised correlation matrix incorporating adjustments for reliability in the drug use measures. Adjusted entries, in addition to product-moment correlations (r), include unstandardized regression coefficients (B) and standardized regression coefficients (beta).

*Because dummy codings were used for this variable (with each category in turn coded 1 while all others are coded 0), one category from the variable had to be excluded from the regression analyses. The category indicated by the asterisk was chosen for exclusion.

Table 9

Annual Use of Alcohol (Follow-Up Measure Scaled 2-11) Predicted from Senior Year Alcohol Use, Sex, and Post-High School Role Status Measures

Predictors	Unadjusted r	Drug Use Measures Adjusted for Reliability[a]				
		r	B	beta	B	beta
Senior Year Use of Alcohol (2-11)	.651	.749	.739	.727	.740	.727
Sex (M=1, F=2)	-.202	-.216	-.366	-.075	-.337	-.069
Living environment*						
with spouse	-.165	-.176	-.741	-.099	-.616	-.083
with partner	.053	.057	.251	.020	.281	.023
with parent(s)*	-.060	-.065	*	*	*	*
all other arrangements	.152	.163	.541	.108	.527	.105
Student Status*						
full-time student	.028	.030			.207	.042
part-time student	-.011	-.012			.025	.003
non student*	-.017	-.018			*	*
Employment Status*						
full-time civilian job	.045	.048			.203	.041
part-time job	-.011	-.012			.197	.034
unemployed (and not student)	-.038	-.041			.018	.002
full-time military (males only)	.054	.058			.330	.020
full-time homemaker (females only)	-.127	-.136			-.313	-.022
all others*	.009	.010			*	*
Multiple Correlation Coefficients			R = R^2 =	.772 .597	R = R^2 =	.774 .599

[a] All statistics, except the unadjusted product-moment correlations displayed in the first column, are derived from a revised correlation matrix incorporating adjustments for reliability in the drug use measures. Adjusted entries, in addition to product-moment correlations (r), include unstandardized regression coefficients (B) and standardized regression coefficients (beta).

*Because dummy codings were used for this variable (with each category in turn coded 1 while all others are coded 0), one category from the variable had to be excluded from the regression analyses. The category indicated by the asterisk was chosen for exclusion.

Table 10

Annual Use of Marijuana (Follow-Up Measure Scaled 2-11) Predicted from Senior Year Marijuana Use, Sex, and Post-High School Role Status Measures

Predictors	Unadjusted r	Drug Use Measures Adjusted for Reliability[a]				
		r	B	beta	B	beta
Senior Year Use of Marijuana (2-11)	.678	.754	.776	.740	.777	.740
Sex (M=1, F=2)	-.155	-.163	-.379	-.065	-.367	-.063
Living environment*						
with spouse	-.122	-.128	-.465	-.052	-.373	-.042
with partner	.118	.125	.897	.061	.931	.063
with parent(s)*	-.063	-.067	*	*	*	*
all other arrangements	.099	.104	.651	.109	.706	.118
Student Status*						
full-time student	-.032	-.034			.107	.018
part-time student	-.002	-.002			.015	.001
non student*	.035	.037			*	*
Employment Status*						
full-time civilian job	.048	.050			.255	.043
part-time job	-.025	-.026			.238	.034
unemployed (and not student)	.011	.012			.114	.009
full-time military (males only)	.035	.037			-.017	-.001
full-time homemaker (females only)	-.071	-.075			-.217	-.013
all others*	-.020	-.021			*	*
Multiple Correlation Coefficients			R = R^2 =	.771 .594	R = R^2 =	.772 .595

[a] All statistics, except the unadjusted product-moment correlations displayed in the first column, are derived from a revised correlation matrix incorporating adjustments for reliability in the drug use measures. Adjusted entries, in addition to product-moment correlations (r), include unstandardized regression coefficients (B) and standardized regression coefficients (beta).

*Because dummy codings were used for this variable (with each category in turn coded 1 while all others are coded 0), one category from the variable had to be excluded from the regression analyses. The category indicated by the asterisk was chosen for exclusion.

Table 11

Annual Use of Other Illicit Drugs (Follow-Up Measure Scaled 2-5) Predicted from Senior Year Other Illicit Drug Use, Sex, and Post-High School Role Status Measures

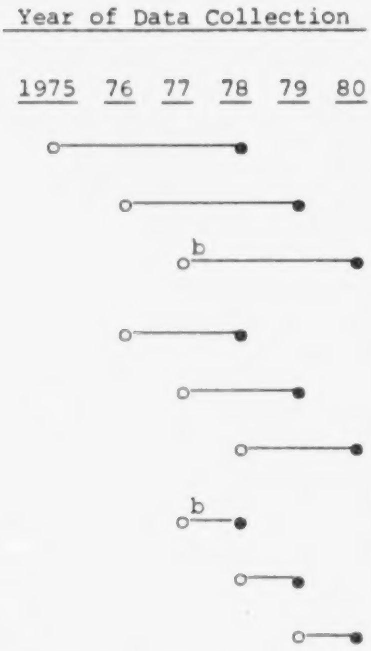
Predictors	Unadjusted r	Drug Use Measures Adjusted for Reliability[a]				
		r	B	beta	B	beta
Senior Year Use of Other Illicit Drugs	.502	.688	.742	.686	.738	.683
Sex (M=1, F=2)	-.049	-.057	-.049	-.030	-.048	-.030
Living environment*						
with spouse	-.092	-.108	-.196	-.079	-.185	-.075
with partner	.106	.124	.209	.051	.215	.052
with parent(s)*	-.041	-.049	*	*	*	*
all other arrangements	.062	.072	.147	.088	.181	.108
Student Status*						
full-time student	-.060	-.071			.036	.022
part-time student	.006	.007			.012	.004
non student*	.059	.069			*	*
Employment Status*						
full-time civilian job	.066	.077			.116	.070
part-time job	-.046	-.054			.023	.012
unemployed (and not student)	.034	.040			.170	.046
full-time military (males only)	.002	.002			-.085	-.016
full-time homemaker (females only)	-.054	-.064			-.035	-.007
all others*	-.026	-.031			*	*
Multiple Correlation Coefficients			R = R^2 =	.704 .495	R = R^2 =	.707 .499

[a] All statistics, except the unadjusted product-moment correlations displayed in the first column, are derived from a revised correlation matrix incorporating adjustments for reliability in the drug use measures. Adjusted entries, in addition to product-moment correlations (r), include unstandardized regression coefficients (B) and standardized regression coefficients (beta).

*Because dummy codings were used for this variable (with each category in turn coded 1 while all others are coded 0), one category from the variable had to be excluded from the regression analyses. The category indicated by the asterisk was chosen for exclusion.

Figure 1

One-Year, Two-Year, and Three-Year Panels Specified by Dates of Base-Year and Follow-Up Surveys



N^a	N_{wt}^a	Description Interval/ Period	
601	479	3-Years/ 76±1 to 79±1	Interval: 2±1 years Period: 1977±2 to 79±1
841	650		
953	719		
864	673	2-Years/ 77±1 to 79±1	
973	735		
1005	754		
990	746	1-Year/ 78±1 to 79±1	
1008	760		
1049	786		

○ = Base-year data collection (senior year of high school)

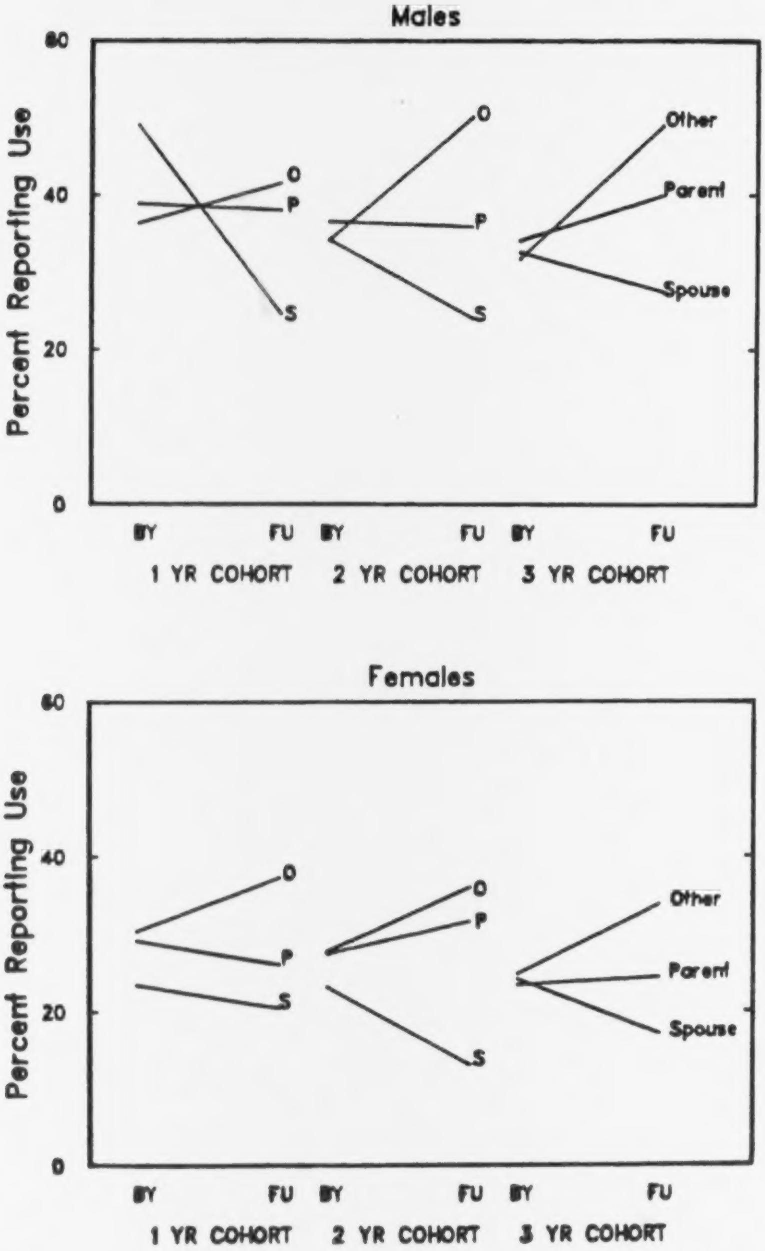
● = Follow-up data collection

[a] Limited to those who participated in follow-up; N = number of cases; N_{wt} = weighted number of cases.

[b] The same subsample of the class of 1977 was followed up in 1978 and 1980, thus these base-year data from the class of 1977 are used twice (see text). All other base-year subsamples, and all other follow-up subsamples, are independent.

Figure 2

Marijuana Use in Past 30 Days by Living Environment[a]:
Base Year and Follow-Up Percentages
Shown Separately for 1-, 2-, and 3-year Cohorts (BY75-79)



---

[a] A four-category variable was created to measure effect of living environment; living with spouse, with parents, with partner, and in other arrangements. Living with partner was omitted in this figure due to limited numbers of cases.

Figure 3

Use of a Half Pack or More of Cigarettes Daily by Living Environment: Base Year and Follow-Up Percentages (1-, 2-, and 3-year Cohorts Combined)

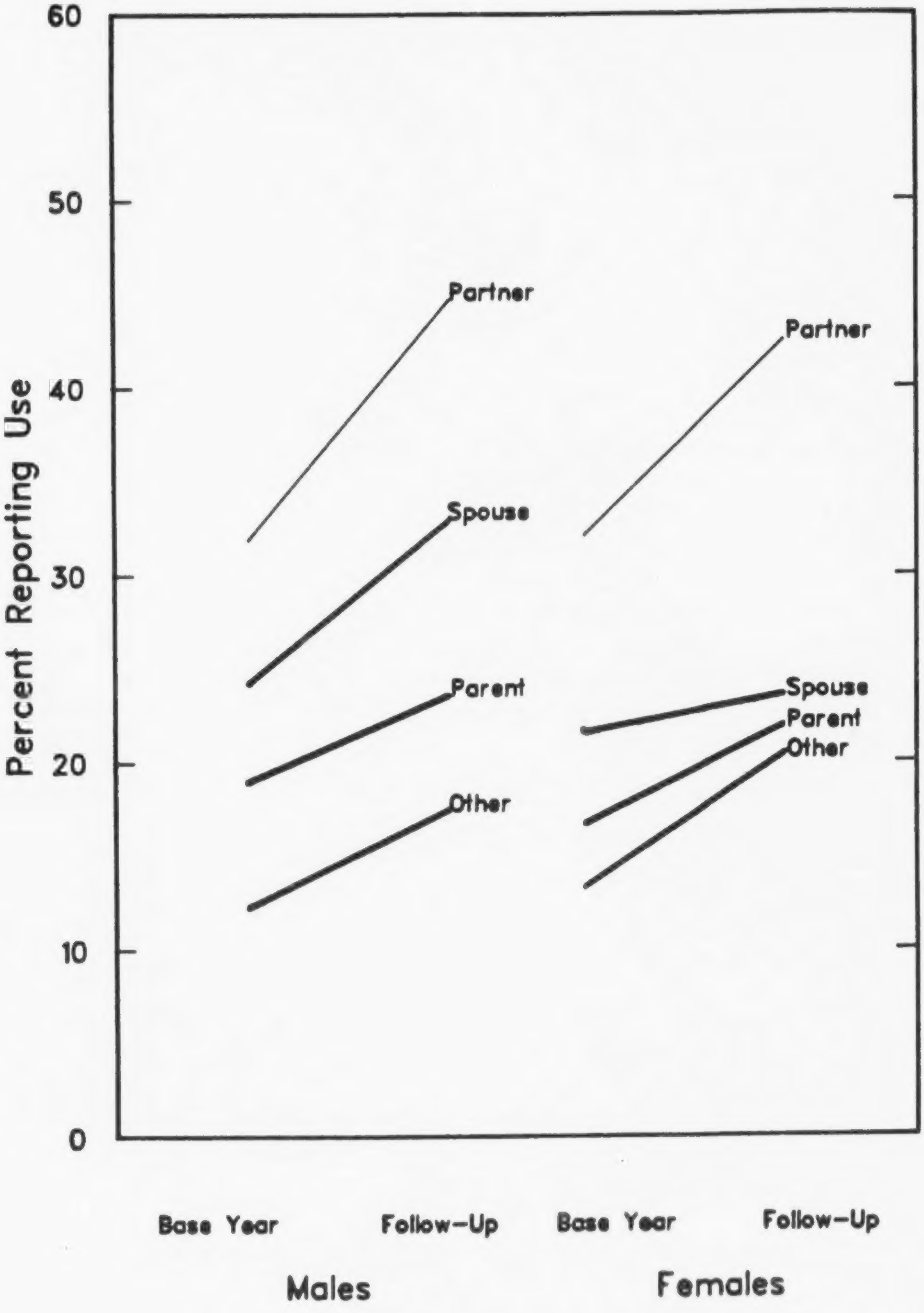


Figure 4

Instance of Heavy Drinking in Past Two Weeks by Living Environment: Base Year and Follow-Up Percentages (1-, 2-, and 3-year Cohorts Combined)

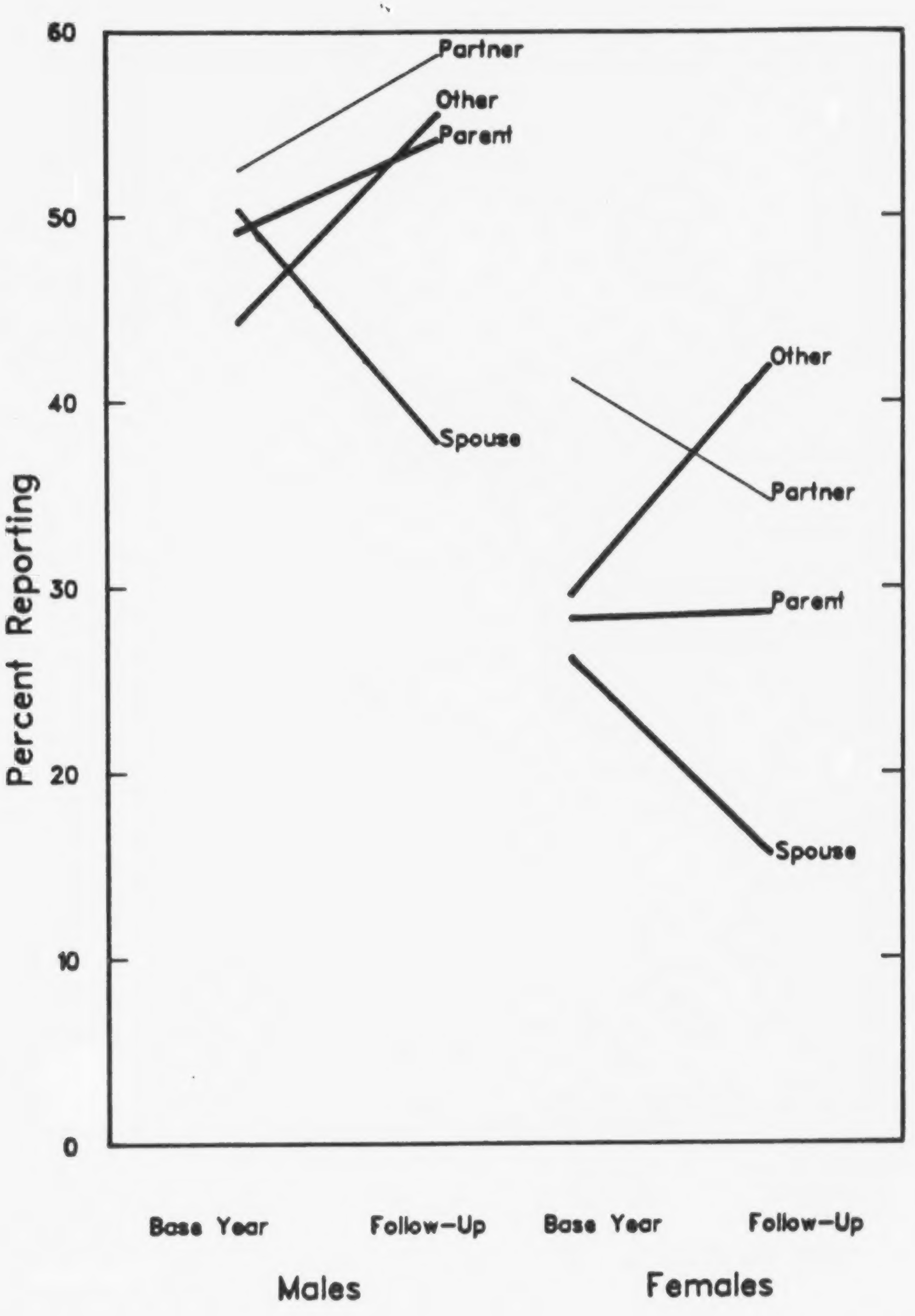


Figure 5

Marijuana Use in Past 30 Days by Living Environment:
Base Year and Follow-Up Percentages (1-, 2-, and 3-year Cohorts Combined)

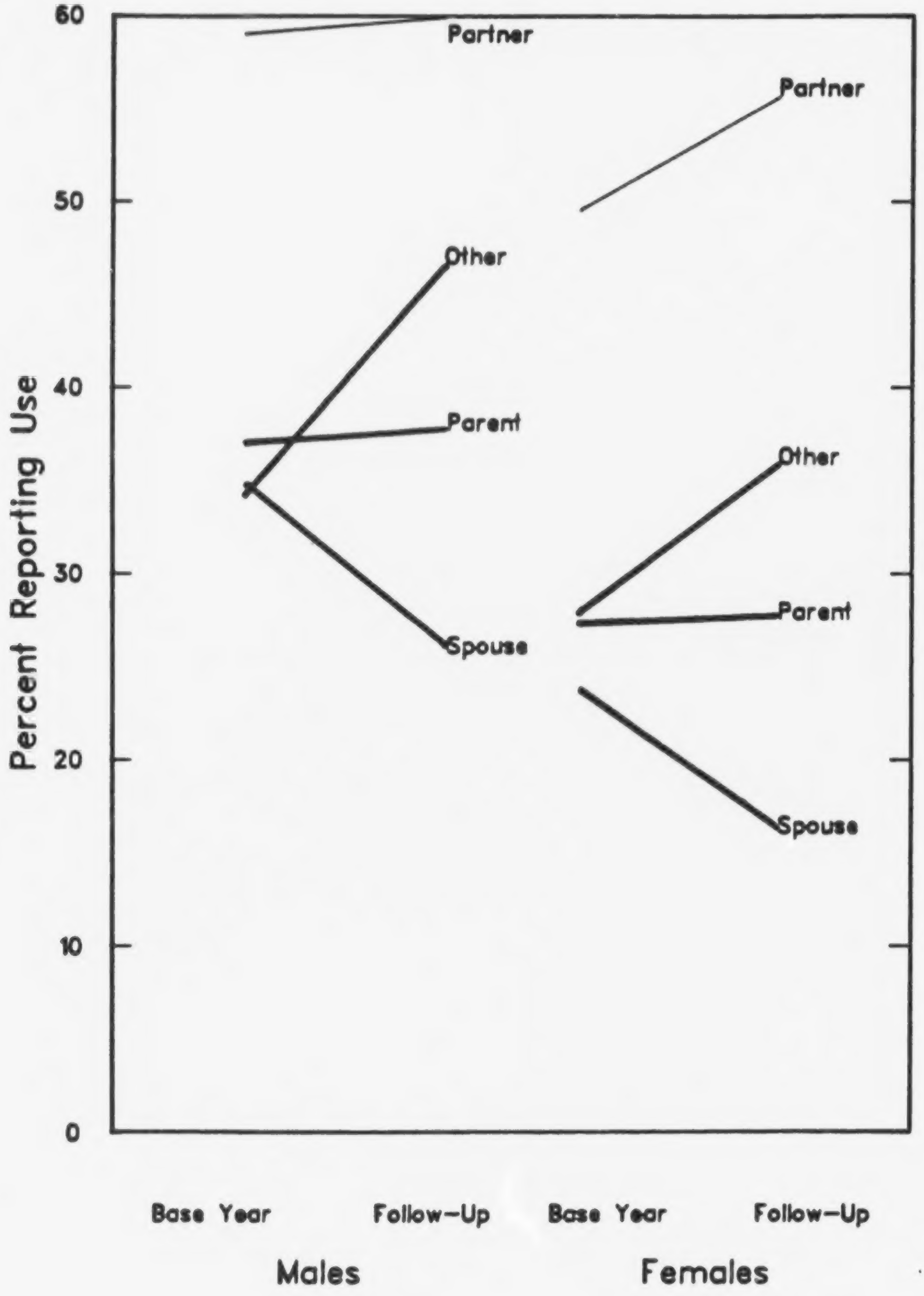


Figure 6

Other Illicit Drug Use in Past 30 Days by Living Environment:
Base Year and Follow-Up Percentages (1-, 2-, and 3-year Cohorts Combined)

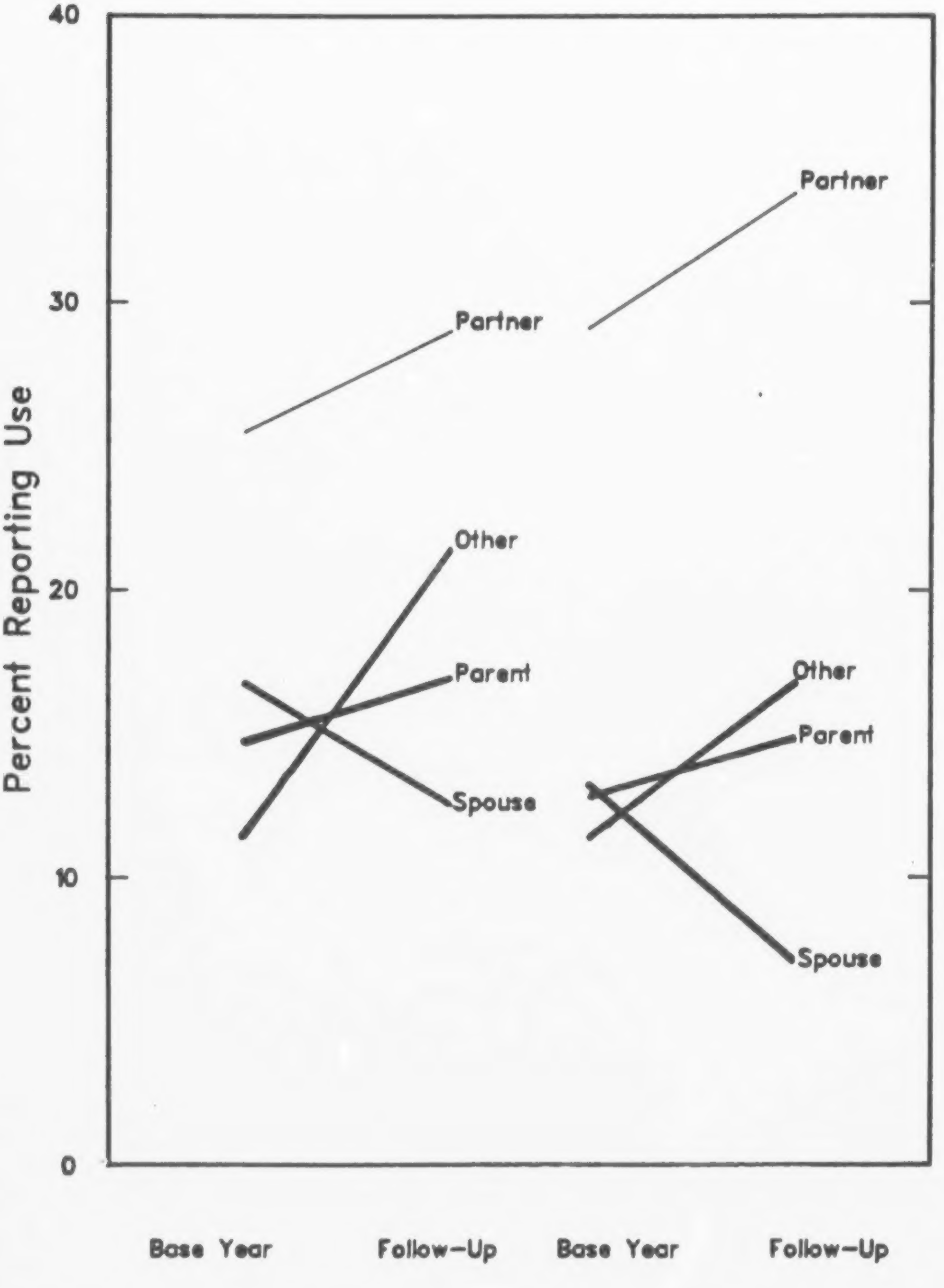


Figure 7

Use of a Half Pack or More of Cigarettes Daily by Student/Employment Status: Base Year and Follow-Up Percentages (1-, 2-, and 3-year Cohorts Combined)

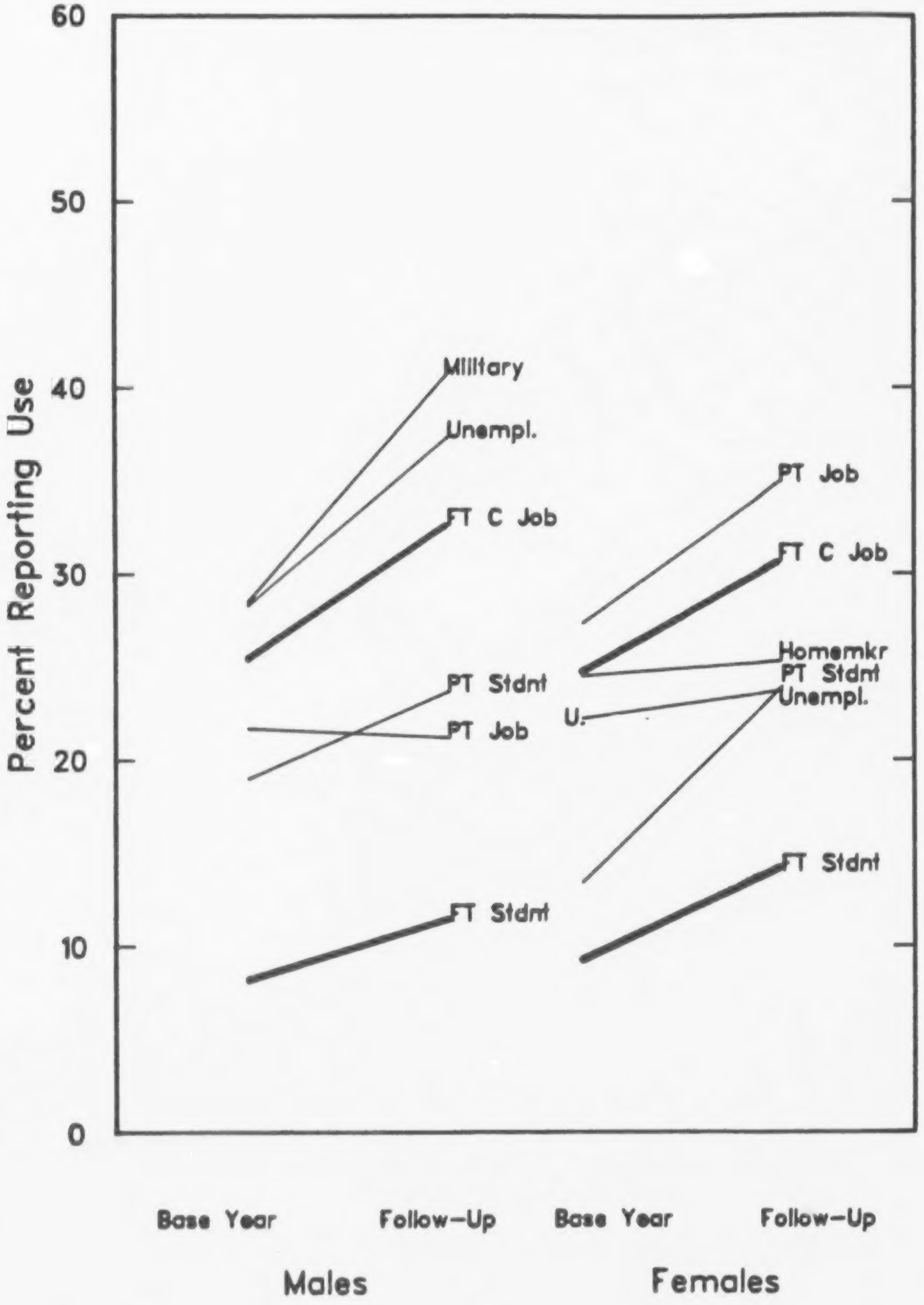


Figure 8

Instance of Heavy Drinking in Past Two Weeks by Student/Employment Status: Base Year and Follow-Up Percentages (1-, 2-, and 3-year Cohorts Combined)

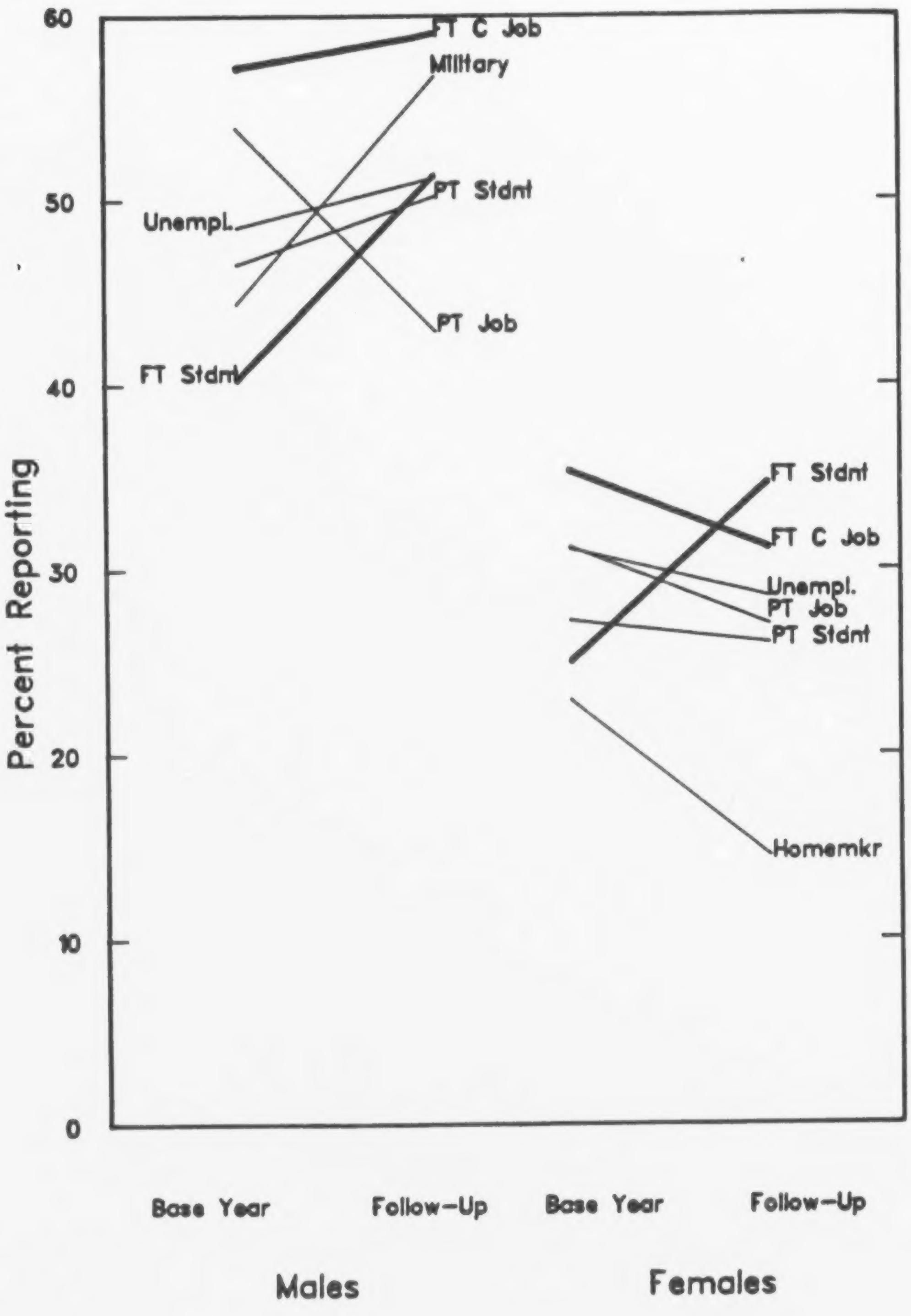


Figure 9

Marijuana Use in Past 30 Days by Student/Employment Status:
Base Year and Follow-Up Percentages (1-, 2-, and 3-year Cohorts Combined)

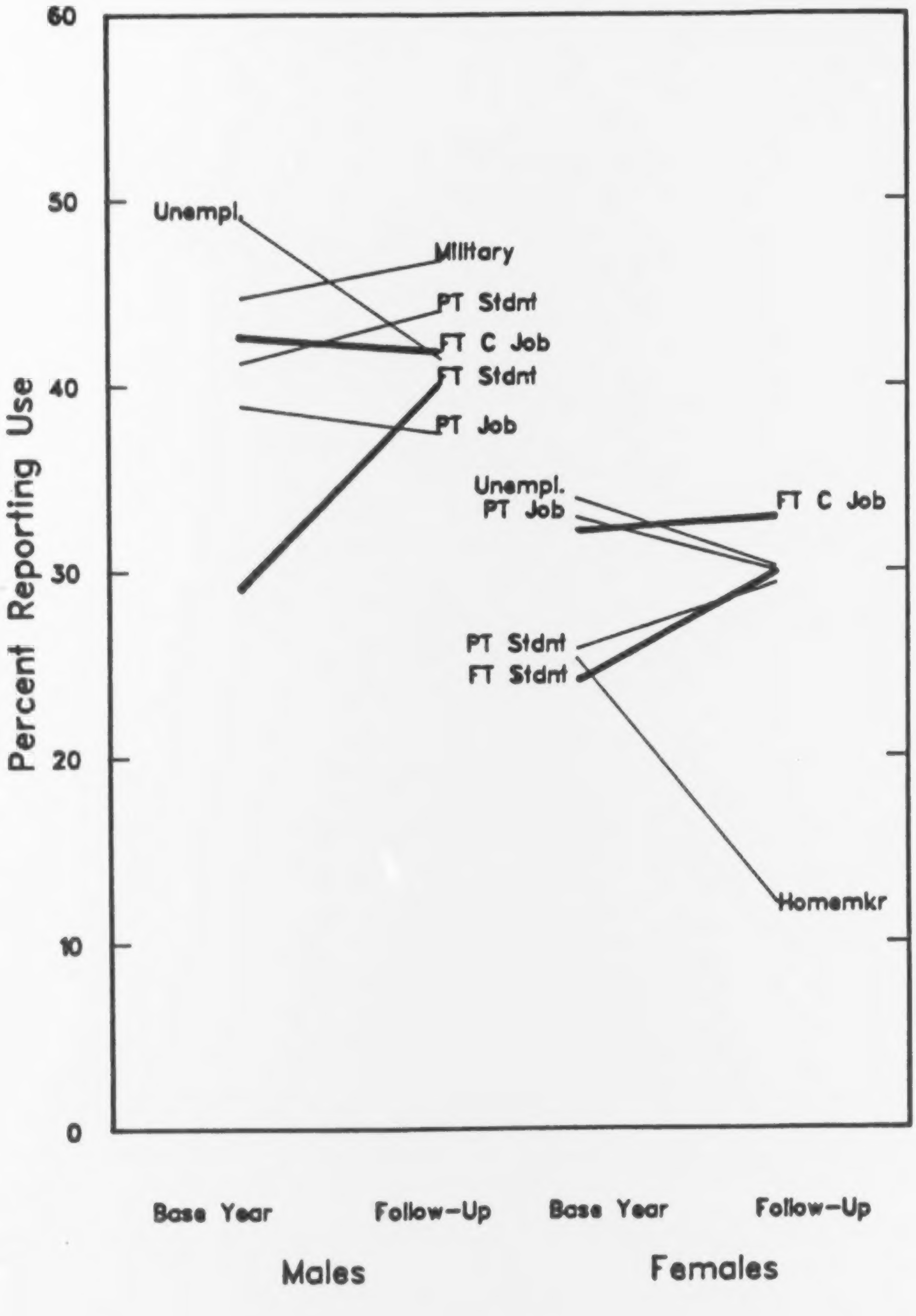
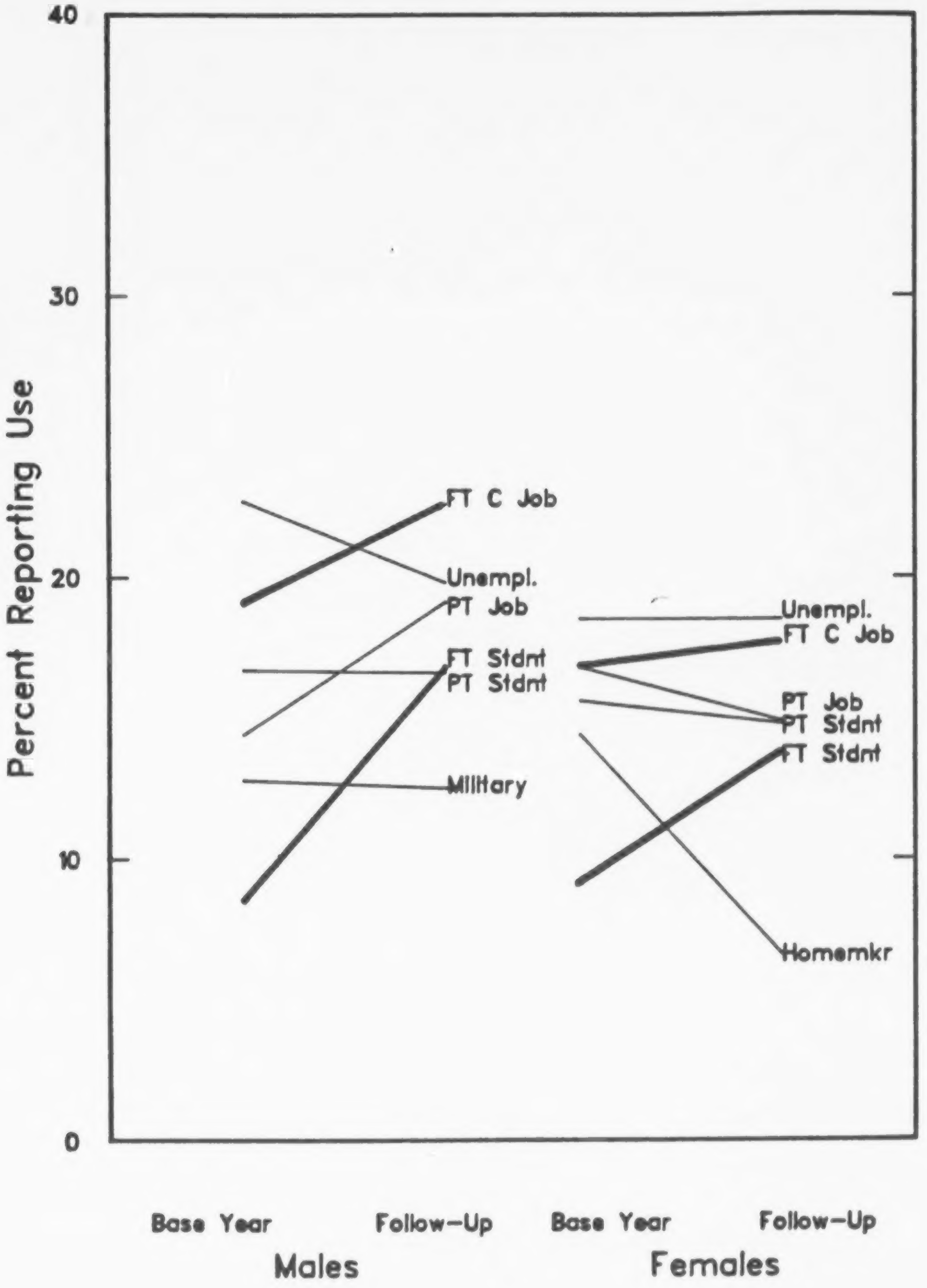


Figure 10

Other Illicit Drug Use in Past 30 Days by Student/Employment Status:
Base Year and Follow-Up Percentages (1-, 2-, and 3-year Cohorts Combined)



APPENDIX A

Research Design and Procedures[*]

The Monitoring the Future research design consists of (a) a series of annual, nationwide questionnaire surveys of seniors in high schools, which began with the class of 1975; and (b) annual follow-up surveys mailed to subsets of each sample during the first ten years following their graduation. Thus the population of interest consists of most young American men and women, in the age range of approximately 18 through 28, monitored through an ongoing series of cohort analyses.

One limitation in the design is that it does not include in the target population those young men and women who drop out of high school before graduation (or before the last few months of the senior year, to be more precise). This excludes a relatively small proportion of each age cohort—between 15 and 20 percent (Dearman & Plisko, 1979)—though not an unimportant segment, since we know that certain behaviors such as illicit drug use (Johnston, 1973) and delinquency (Bachman, O'Malley, & Johnston, 1978) tend to be higher than average in this group. For the purposes of estimating characteristics of the entire age group, the omission of high school dropouts does introduce certain biases; however, their small proportion sets outer limits on the bias.

Base-Year Data Collections

The project surveys high school seniors during the spring of each year. Each data collection represents the start of a panel study of that year's high school class. Thus we refer to each senior class survey as a base-year data collection.

Samples of High School Seniors. The base-year data collection each year takes place in approximately 115 public high schools and 15 private high schools, selected by the Sampling Section of the Survey Research Center to provide an accurate cross section of high school seniors throughout the United States. The sampling procedure is multi-stage (Kish, 1965) as follows: Stage 1 is the selection of particular geographic areas, Stage 2 is the selection of one or more high schools in each area, and Stage 3 is the selection of seniors within each high school.

Stage 1: Geographic Areas. The geographic areas used in this study are the primary sampling units (PSU's) developed by the Sampling Section for use in the Survey Research Center's nationwide surveys. These consist of 74 primary areas throughout the coterminous United States. In addition to the 12 largest metropolitan areas, containing about 30 percent of the nation's population, 62 other primary areas are included: 10 in the Northeast, 18 in the North Central area, 24 in the South, and 10 in the West.

Stage 2: Schools. In the major metropolitan areas more than one high school is often included in the sampling design; in most other sampling areas a single high school is sampled. In all cases, the selections of high schools are made with probability proportionate to size of senior class. The larger the senior class (according to recent records), the higher the selection probability assigned to the high school. (For a discussion of this procedure and its advantages, see Kish, 1965, pp. 220f.) If a sampled school is unwilling to participate, a replacement school is selected from the same geographic area. (This occurs for fewer than thirty percent of the sampled schools.)

---

[*] This appendix was adapted from a more extensive description of the research design and procedures (Bachman & Johnston, 1978).

Stage 3: Students. Within each selected school, up to about 400 seniors may be included in the data collection. In schools with fewer than 400 seniors, the usual procedure is to include all of them in the data collection. In larger schools, a subset of seniors is selected either by randomly sampling classrooms or by some other random method that is convenient for the school and judged to be unbiased. All respondents in a school are assigned a sample weight which takes account of variations in the sizes of samples from one school to another, as well as the (smaller) variations occurring at the earlier stages of sampling.

The result of this three-stage sampling procedure is a nationally representative cross section of about 16,000 to 18,000 young men and women in the senior classes of about 130 high schools throughout the United States. Because the schools are located in the primary sampling units used by the Survey Research Center for personal interview studies, we are able to use local SRC field representatives to administer the questionnaires in the schools. The data collection methods are described below.

It should be noted that each survey employs five different questionnaire forms. For those key drug use and demographic variables which appear in all forms, the full sample provides data each year. For other measures, the sample size is over three thousand seniors each year.

One other important feature of the base-year sampling procedure should be noted. Each school (except for half of those in the initial 1975 sample) is asked to participate in two data collections, thereby permitting us to replace half of the total sample of schools each year.

Questionnaire Administration. The actual questionnaire administration in each school is carried out by the local Survey Research Center representatives and their assistants, following standardized procedures detailed in a project instruction manual. The questionnaires are administered in classrooms during normal class periods whenever possible; however, circumstances in some schools require the use of larger group administrations.

Procedures for Assuring that Participation is Voluntary and that Confidentiality is Protected. In any study that includes voluntary reporting of drug use, it is essential to develop procedures which guarantee the confidentiality of such reports. It is also desirable that these procedures be described adequately to respondents so that they are comfortable about providing honest answers, and that the voluntary nature of their participation be made clear.

The first information given to students about the survey consists of a descriptive flyer stressing confidentiality and voluntary participation. These themes are repeated in the oral instructions at the start of the actual questionnaire administration; and the SRC representative specifically tells any students who do not wish to participate that they have the option of working quietly on their own school work during the class period. Each participating student is instructed to read the message on the cover of the questionnaire, which stresses the importance and value of the study, notes that answers will be kept strictly confidential, and makes this further statement about voluntary participation: "This study is completely voluntary. If there is any question you or your parents would find objectionable for any reason, just leave it blank." The instructions then point out that in a few months a summary of nationwide results will be mailed to all participants, and also that a follow-up questionnaire will be sent to some students after a year. The cover message explains that these are the reasons for asking that name and address be written on a special form which will be removed from the questionnaire and handed in separately. The message also points out that the two different code numbers (one on the questionnaire and one on the tear-out form) cannot be matched except by a special computer tape at The University of Michigan.

Follow-Up Data Collections[*]

The design of the Monitoring the Future study calls for longitudinal follow-ups of each graduating class. The follow-ups are to be conducted by mail on an annual basis for a period of ten years following high school graduation. Thus, for example, by 1985 the design calls for follow-ups of ten different panels—samples from the high school classes of 1975 through 1984.

Sub-Samples for Follow-ups. Given the considerable cost and staff effort involved in conducting follow-up surveys—particularly when up to ten previous classes are to be followed—we decided to select only a sub-sample of each original class sample for inclusion in the follow-up panel. For sub-sampling purposes, the respondents from each year's senior class are divided into two strata. The first stratum consists of all individuals whose questionnaire responses indicate that they used marijuana on twenty or more occasions during the past month, i.e., on nearly a daily basis, or used some other illicit drug(s) at least once during the month prior to the senior year data collection. (Between 15 percent and 20 percent of the total base-year sample falls into this stratum.) About 30 percent of these individuals are included in the follow-up data collection. The other stratum consists of all other respondents. About 10 percent of them are included in the follow-up data collections. Thus, the recent drug-using stratum is overrepresented in the follow-up sample by a ratio of 3 to 1.

The rationale for over-sampling drug users, as defined in the first stratum, is two-fold. First, the study is designed to monitor drug use, and this is by far the single most important area of research treated in the project. Second, the proportions of the age group using each of the illicit drugs other than marijuana are sufficiently low that over-sampling is needed to produce enough cases for detailed longitudinal analysis. The same is true for the particularly important subgroup consisting of daily marijuana users.

---

[*] The follow-up design and procedures were modified extensively after the 1977 data collection. This section describes the new approach. In 1976 and 1977 follow-ups, larger numbers of individuals were invited to participate and no payment was used; but the response rates were about 65 percent in the first year of follow-up and still lower in the second year. These rates were judged by the investigators to be inadequate, so more intensive procedures were developed for use on smaller samples.

The process of sub-sampling to select follow-up respondents is carried out using a random procedure in which the probability of any individual being selected for follow-up is proportional to his/her base-year sampling weight. (The procedure is carried out separately for those in the "recent drug use" stratum, and for those in the stratum consisting of all other base-year respondents.) The base-year sampling procedure is such that sampling weights are necessary. In particular, the fact that our data collection may include as many as 400 seniors per high school means that some schools are represented by nearly 400 students, whereas other smaller schools may be represented by only 100 or fewer. The result is that students from small schools are likely to have higher weights (i.e., be counted more heavily) than students from larger schools. This variation in sampling weights arises from administrative needs in the base-year data collection; but for the follow-up data collections it is much more efficient to have essentially equal weights. By sub-sampling with probability of selection proportional to base-year sampling weight, we can then assign follow-up weights that are equal for virtually all respondents within each stratum. (Then, to adjust for the over-sampling of follow-up respondents in the "recent drug use" stratum, at the analysis stage we assign them weights one-third the size of the weights of those assigned to the other stratum.)

The sub-sampling procedures described above are applied to each graduating class, thereby producing the target sample for a longitudinal panel which will then be involved in ten annual follow-up data collections. Each such target sample is then split into two equal halves (cutting across both the strata discussed above and all base-year schools). Respondents in one half are sent follow-up questionnaires on the odd numbered years following graduation; those in the other half are sent questionnaires on the even-numbered years. This strategy permits us to have twice as many respondents from a given class as we would if we returned to the same individuals all ten times. However, the primary motivation for requesting biannual rather than annual participation was to reduce the burden on individual respondents, and thus maintain a higher level of continuing participation while still having enough information on each respondent to permit quite detailed longitudinal analyses. The fact that half the follow-up respondents from any graduating class are surveyed one year, and the other half are surveyed the next, means that we still retain the capability of doing detailed cohort trend analyses on an annual basis.

Follow-Up Procedures. The follow-up procedures consist largely of a series of mailings. The first item is a newsletter mailed in December, which describes some of the project findings for that year and also announces that there will be a follow-up data collection in a few months. Included with the newsletter is a card asking the respondent to indicate any change of address or change of name. This mailing thus serves three distinct purposes: (a) it gives all the respondents some feedback from the earlier data collection; (b) it announces the forthcoming data collection to potential participants; and (c) it provides an occasion for updating the file of names and addresses.

The next mailing consists of the questionnaire used in the follow-up study, which is sent out in late March or early April. Enclosed with each questionnaire is a check for five dollars made out to the respondent. Return postage-paid mailing envelopes are provided, and an address correction form is attached to the back of the questionnaire. The mailing label containing the respondent's name and address is affixed to the form; respondents are asked to separate the form from the questionnaire (leaving only a code number to identify the questionnaire).

Within a week after the initial mailing of questionnaires, postcards are sent to all target respondents. The message contains a word of thanks to those who already have completed their questionnaires, and reminds others that the questionnaires are very important to us and that we hope for an early response.

The next steps in the process are contingent upon receipt or non-receipt of a completed questionnaire. About two to three weeks after the initial questionnaire mailing, a letter is sent to all those who have not yet responded indicating that we have not received the questionnaire and urging them to complete and return it as soon as possible. Several weeks later an attempt is made to telephone all those who still have not responded. Finally, several weeks after that, thank-you letters are sent to all who completed the follow-up questionnaire.

APPENDIX B

Estimates of Reliability of Drug Use Measures

Drug use one, two, three, or more years beyond high school is strongly correlated with use of that same drug during senior year. On the other hand, the correlations over time (autocorrelations) are far from perfect, and this lack of complete correlation occurs for at least two reasons:

1. Some real change in levels of drug use occurs during the years following high school. More precisely, there are differential changes across individuals during the years following high school, with some individuals increasing their drug use levels and others lowering them. (If everyone changed upward, or downward, by exactly the same amount, such change would not lower the correlation over time because the relative positions of individuals would not shift.)

2. There are errors in the measurement process, some of which also reduce the size of correlations over time. These measurement errors occur because of imperfect memories, carelessness in responding, and other fairly random events. It should be noted, however, that some other kinds of errors in responding are not strictly random and thus may not serve to lower the correlations between drug use reports at different points in time. For example, if some respondents consistently forget instances of drug use and thus systematically underreport their true usage levels at each point in time, such correlated errors may actually raise the autocorrelations rather than lower them. The same would be true if a certain subset of respondents who sometimes used a particular drug would consistently deny any such use.

The above very brief discussion should be sufficient to indicate that developing precise estimates of the accuracy of drug use measures and the stability of actual drug usage is far from a simple matter. It is a highly complicated issue which will require analysis efforts far beyond the scope of the present paper. Our present objectives are much more modest. We recognize that the stability of drug use across time is almost surely somewhat higher than indicated by the autocorrelations, simply because of the operation of random measurement error. Accordingly, we consider it useful to adjust relationships to take account of such random measurement errors.

Our purpose in this appendix is to document both the logic, and the actual computation procedures, which were the basis for our estimates of reliability (i.e., estimates of the effects of random measurement error) for our drug use measures. We assume that readers of this occasional paper will vary considerably in their enthusiasm for, and familiarity with, some of the topics addressed here. For those readers who have not struggled with these issues before, this appendix is intended to provide a relatively simple introduction. For those readers who are already familiar with some or all of these issues, we have tried to state clearly our position and our approach—although some of those statements take the form of fairly technical footnotes. For those readers who prefer to "take our word for it" rather than get into the details of reliability estimates, this appendix can be skimmed or skipped (a choice which some have no doubt made before reaching this point!).

Our estimation of random measurement errors is basically that presented by Heise (1969). We are aware of the limitations in that approach, as discussed by Wiley and Wiley (1970), Wiley and Wiley (1974), Wheaton, Muthen, Alwin, and Summers (1977), and others; indeed, we have already noted some of the problems and will mention others. Nevertheless, for present purposes a relatively simple and straightforward approach to estimating random measurement errors is desirable. We view this as no more than a temporary solution—sufficient, we hope, to permit us to present the major substantive findings of this paper in a somewhat more accurate form than would be the case with no adjustment for random measurement error.

What We Mean by "Random Measurement Error." It would be convenient if we could follow Heise (1969, p. 94) in treating errors of measurement as the difference between an obtained measurement, x', and what we conceive of as a "true" value of the underlying variable, x. Unfortunately, that does not quite correspond to our view of the real world. It seems more accurate to begin with the fact that we have obtained measurements which include some component of random measurement error, and then try to understand what would be left if we could "remove"—i.e., make statistical adjustments for—the random measurement error portion of our obtained measurements. What would be left with random measurement error removed would be the "true" values of x plus all non-random errors, including the correlated errors mentioned earlier. We think our present approach can do a reasonably good job of adjusting for random measurement errors, but it does not deal with the correlated errors.

Another point of clarification has to do with what "true" value we are trying to approximate. Our measures of drug use ask respondents to report on their behavior during particular intervals of time. Our concept of random measurement error includes not only errors in respondents' reports of what actually happened during the particular intervals covered, but also any "error" or unrepresentativeness of the particular time interval chosen as a behavior sample. Thus, for example, if a respondent's marijuana use during the past thirty days is atypically low, that represents a random measurement error, given that our purpose is to characterize marijuana use during a "typical" month within the past year (rather than the particular thirty days that happened to be covered by our question). A more compelling example, perhaps, involves the measure of frequency of heavy drinking during the past two weeks. Suppose some respondents have a general pattern of drinking heavily (five or more drinks on one occasion) about once a month, on the average. If we survey such people and ask about their drinking during the past two weeks, about half (or slightly more) are likely to report no instances, a bit under half are likely to report one instance, and a few are likely to report two or more instances. This would occur assuming they made no errors of recall whatsoever; nevertheless, we would consider that there was a good deal of random measurement error involved when this set of reports is used as a basis for representing overall tendencies to be involved in instances of heavy drinking. In other words, the random error would be attributable to the limited behavior sample rather than to respondent mistakes in reporting.*

---

*One can, of course, ask questions covering longer time intervals, and thus reduce or avoid this particular problem. Other difficulties arise, however, as illustrated in our analysis of discrepancies between monthly and annual reports of drug use (Bachman and O'Malley, 1980, 1981).

Since our present interest is with drug use tendencies during the year preceding data collection, limitations in behavior samples such as those illustrated above are part of what we would interpret to be random measurement error. Fortunately, the underlying logic of the Heise (1969) approach for estimating reliability is consistent with that interpretation.*

In sum, we consider random measurement errors to include (a) those respondent errors or mistakes in reporting which are genuinely random, and (b) any random "unreliability" or "unrepresentativeness" in the behavior sample as a basis for estimating somewhat longer-term behavioral patterns. We recognize that this is not as neat and clear a delineation of random measurement errors as might be desirable; however, we think it is a fairly realistic one.

"Stability" Defined as Autocorrelations Adjusted to Remove the Effects of Random Measurement Errors. Consider the correlation between an obtained measurement at one point in time, and an obtained measurement of the same dimension at another point in time. If that correlation is adjusted to remove random measurement errors, then what remains can be treated as an indicator of "stability." Taking an example from Table 5, the autocorrelation between cigarette smoking during one month late in the senior year and cigarette smoking during one month approximately two years later is .73, but after adjustments for random measurement error the estimated "true" (or "truer") correlation is .82. This is what Heise calls a stability coefficient, and we would like to follow the same usage. It is necessary, however, to clarify what we think is involved in such "stability" across time. As noted earlier, stability coefficients will include the effects of errors or distortions which are consistent across time rather than random. Thus if some respondents consistently deny using cigarettes when in fact they use varying amounts at various times, the effects of such reporting will be to present a pattern of higher cross-time consistency (i.e., greater "stability") than actually exists.

Even if such correlated errors could be removed, it would not be correct to interpret the remaining stability as indicating a simple causal impact—that, for example, cigarette use during senior year "causes" cigarette use two years after high school. Rather, we can say only that later cigarette use is highly predictable from senior year use of cigarettes, and that this probably reflects some stable causal factors. One such causal factor is likely to be concern about the health consequences of smoking cigarettes. If somehow such concerns were greatly reduced, it would be reasonable to expect a resulting reduction in stability of smoking behavior (since some number of consistent non-smokers might then feel free to indulge and some smokers might increase their amount of smoking). To take another example, if some smokers who are concerned about their weight were shown a fairly easy way to quit smoking and not gain weight then there might be an upswing in the number of quitters, with a consequent reduction in stability. The point of these somewhat fanciful illustrations is that our stability estimates do incorporate the effects of a variety of fairly stable "external" variables, many of which are not (and perhaps cannot be) clearly specified.

We noted in the results section of this paper that autocorrelations linking high school drug use with post-high school drug use were somewhat higher among those who continued to be living with their parents at the time of the post-high school data collection. (This was, incidentally, less true for cigarette use than for heavy drinking, use of marijuana, and use of other illicit drugs.) It seems reasonable to suppose that those continuing to live with their parents are subject to many of the same constraints/opportunities/etc. as were true during their high school days. Thus, we can expect that a higher degree of stability (in the sense that we are using it here) would be evident among these individuals, since many of the "external" factors influencing drug consumption were relatively consistent across time.*

---

*This is equally true for the Wiley and Wiley (1970) and the Wheaton et al. (1977) approaches.

In sum, we are interested in estimates of drug use stability which do include the effects of relatively constant (or stable) external determinants. We recognize that we assess stability within a given set of environments, and that changes in these environments may result in different levels of stability. We do not, in other words, think of stability "in the abstract" or free from specific environmental contexts. The fact that our stability estimates also may include the effects of systematic (non-random) errors or biases is troublesome, of course, although it is worth noting that our survey procedures (e.g., guarantees of confidentiality, care in question wording, etc.) are designed to minimize such problems. On balance, we feel comfortable that the systematic errors and biases have not seriously distorted our substantive findings and conclusions.

A Strategy for Estimating Reliability and Stability. We indicated above that we wish to be able to make adjustments for the effects of random measurement errors, which we will call adjustments for unreliability; and we wish also to estimate stability, which we will define as autocorrelations with the effects of random errors removed. We outline below our logic and procedures. (The reader who is familiar with Heise's treatment of this problem may wish to skip directly to the final three paragraphs of this section.)

We begin by considering Heise's (1969) path diagram for three waves of measurement, shown in Figure B-1.** In that figure, x'_1 indicates the obtained measurement of variable at time 1, x'_2 indicates the obtained measurement of that same variable at time 2, and x'_3 indicates the obtained measurement of that variable at time 3. The corresponding x_1 and x_2 and x_3 can be thought of as the "truer" values of the underlying variable, x. (By this usage we mean that the x values are more nearly true than the x' values; but they are not completely "true" for reasons outlined in the earlier sections.) Thus, to make a specific example, we may have three measures of cigarette use, one obtained from seniors in 1976 (time 1), one obtained from them two years later in 1978 (time 2), and one obtained two years after that in 1980 (time 3). These obtained measures are considered to be the result of two factors: (a) the "truer" dimension consisting of actual cigarette consumption plus any non-random error, and (b) random error in the reports of cigarette consumption. Following the conventions of path analysis, the correlations among measured variables x'_1 and x'_2 and x'_3 can be expressed as follows:

---

*Wheaton et al. (1977) argue for a more narrow definition of stability which would exclude such external variables. Our preference for a broader definition derives from the conceptual or theoretical considerations just discussed, and also from some practical considerations. From a practical standpoint, it seems impossible to define all possible external causes, much less measure them with sufficient accuracy; the problem of unspecified and unmeasured external variables will, like the poor, always be with us.

**As Wheaton et al. (1977) point out, the path diagram reproduced as Figure B-1 ignores the potential existence of stable external causal factors. For an alternative representation, see their Figure 2 (p. 89). Our present use of Figure B-1 is as a convenient guide to the equations which follow. We do not wish to imply that path p_{21} and path p_{32} are strictly causal; rather, they represent "stability" as we have chosen to use that term (which means any effects of stable external factors are included).

$$r_{12} = P_{xx_1} P_{21} P_{xx_2}$$

$$r_{23} = P_{xx_2} P_{32} P_{xx_3}$$

$$r_{13} = P_{xx_1} P_{21} P_{32} P_{xx_3}$$

The equations above can also be stated in words, albeit a bit loosely. In effect, the equations assert that the correlation between two measures of a variable at two different points in time is a product of (a) the "true" (or "truer," as discussed above) change or stability over time, (b) the accuracy of the first measurement (i.e., lack of random measurement error), and (c) the accuracy of the second measurement. Given this approach and given some assumptions (discussed below), we have the ingredients for developing estimates of reliability and stability (as those terms have been outlined above).

Consider the relationship between the equations for r_{12} and r_{13}:

$$\frac{r_{13}}{r_{12}} = \frac{P_{xx_1} P_{21} P_{32} P_{xx_3}}{P_{xx_1} P_{21} P_{xx_2}} = \frac{P_{32} P_{xx_3}}{P_{xx_2}}$$

Note that two ingredients in the right-hand version of the equation reflect the accuracy of follow-up measures—in one case the measure at time 2 and in the other case the measure at time 3. Suppose we are willing to make the assumption that the two follow-up measurements have identical levels of accuracy. Assuming that

$$P_{xx_2} = P_{xx_3},$$

$$\frac{r_{13}}{r_{12}} = P_{32}$$

Stated in words, if we are willing to assume that the measurement reliability* is the same in the two follow-up surveys, then the only difference between the time 1-3 and time 1-2 autocorrelations is the stability of "actual" (i.e., "truer") drug use from time 2 to time 3. Thus, we are able to estimate stability for the time 2-3 interval.

Given that we can estimate stability for time 2-3, we are now in a position to isolate something analogous to test-retest reliability in the time 2-3 autocorrelation.

Recall that $r_{23} = p_{xx_2} p_{32} p_{xx_3}$

It then follows that $\frac{r_{23}}{p_{23}} = p_{xx_2} p_{xx_3}$,

which Heise (1969, p. 97) describes as ". . .a new measure of reliability based on test-retest data but free of temporal change effects."

Given that $p_{23} = \frac{r_{13}}{r_{12}}$

Then, by substitution, $p_{xx_2} p_{xx_3} = \frac{r_{23}}{\frac{r_{13}}{r_{12}}} = \frac{r_{12} r_{23}}{r_{13}}$

In sum, the test-retest reliability for the follow-up drug use measures can be estimated as $\frac{r_{12} r_{23}}{r_{13}}$. (This is identical to Heise's Formula 9.)

Additionally, the estimate of the effects of random measurement error for any follow-up drug use measure can be expressed as

$$\sqrt{\text{test-retest reliability}} = \sqrt{\frac{r_{12} r_{23}}{r_{13}}} = p_{xx_2} = p_{xx_3}$$

We are now left with the problem of estimating reliability (i.e., the effects of random measurement error) for the initial drug use measures, those obtained via group-administered questionnaires during the senior year of high school. We have observed that autocorrelations between drug use measures obtained in senior year and those obtained two years later tend to be lower than autocorrelations involving drug use over other two-year intervals during the period following high school. (Illustrations are included in Table B-1.) This could reflect (a) more measurement error in the initial survey than in the follow-up surveys, (b) more "real" change

---

*The Heise (1969) procedure assumes equal reliabilities over time, whereas the Wiley and Wiley (1970) procedure assumes equal error variances. As we spell out in a later footnote, this makes no practical difference in the present application, and thus we have chosen to follow the simpler Heise procedure.

(i.e., lower stability) during the first two years after high school than in later two-year intervals, or (c) both of the above. Our own view is that there really is more change occurring during the first year or two after high school than in later one-or two-year intervals; and the findings reported in this paper (e.g., the different trends in drug use for those who do and do not leave the parental home soon after graduation) are consistent with that view. On the other hand, we could not confidently assert that there are no differences in measurement error between the group administered senior year questionnaires and the mailed follow-up questionnaires; it seems quite possible that random error would be a bit higher for the senior year measurement.

Given the above considerations, we have opted for the present to assume equal reliabilities for the senior year measures and the follow-up measures. We think there is some chance that eventually we will conclude that measurement error is slightly higher (i.e., reliability slightly lower) for the senior year drug use measures; but if that does prove to be the case, we do not expect the difference to be large. In the meantime, it seems reasonable to assume equivalence in reliability. (At worst, doing so means that we slightly underadjust senior year drug use correlations when we correct for random measurement error.)

To summarize, for present purposes we are making two assumptions about the reliability of the drug use measures. First, we assume that it is equivalent across follow-up surveys; and we feel fairly confident that this assumption will, upon further and more extensive analysis, prove to be reasonably accurate. Second, we extend that assumption of equivalence in reliability to include the base-year (high school senior) surveys; here we see some possibility that further analysis will yield estimates which are different, but only slightly so. These assumptions, coupled with the derivations outlined above (and based directly on Heise's work) can now be stated more formally in the following equation:

$$P_{xx_1} = P_{xx_2} = P_{xx_3} = \sqrt{\frac{r_{12} r_{23}}{r_{13}}}$$

This is equivalent to Heise's (1969, p. 97) statement:

> ". . .a new measure of reliability based on test-retest data but free of temporal change effects" = $\dfrac{r_{12} r_{23}}{r_{13}}$

Computing Reliability Estimates. Given the formula shown above, it remains only to obtain a set of autocorrelations for each of the drug use measures obtained at three points in time, and then perform the necessary computations. For reasons discussed earlier in this paper, we preferred to rely on follow-up data collected from 1978 onward; and given that all those who participated in the 1978 follow-up were also invited to participate in the 1980 follow-up, we were able to select members of the classes of 1975, 1976, and 1977 as sources for the autocorrelations. As a result, the time 1 - time 2 interval ranges from one year to three years (1975-1978, 1976-1978, and 1977-1978), while the time 2 - time 3 interval covers a two-year range in all cases (1978-1980).

Table B-1 presents autocorrelations for five drug use measures, based on each of the three panels outlined above. Also shown are the test-retest reliability estimates using the formula spelled out in the preceding section. An examination of the table prompts the following observations:

1. As indicated in the first two columns, and as discussed elsewhere in this paper, the longer the time interval the lower the autocorrelation. This is not true without exception, but it is a fairly strong and consistent overall pattern.

2. The autocorrelations for the two-year interval (1978-1980), shown in the third column, do not show a consistent pattern of differences related to high school class. In other words, whether the interval occurred one-to-three years beyond high school, two-to-four years, or three-to-five years does not seem to affect the size of autocorrelations in a systematic way.

3. Notwithstanding the above observation that systematic differences are not evident in the third column, there is a fair degree of variability, which appears to be random. This, coupled with a certain unevenness in the patterns of correlations in the first two columns, should serve to caution us that while we can use these data to estimate reliability, those estimates are likely to contain some degree of (random) error.

4. The reliability estimates shown in the final column of the table do, indeed, display some variability. We do not discern any clear pattern related to differences between cohorts, however. (The class of 1977 produced the highest reliability estimate for the heavy drinking measure; the class of 1975 produced the highest reliability estimate for the more general measure of alcohol use; and the class of 1976 produced the highest reliability estimate for each of the other three dimensions of drug use.)

Given the above observations based on Table B-1, we concluded that a reasonable approach would be to select the median reliability estimate from each "trio" as the estimate to be employed for present purposes. We also concluded that such estimates should be represented as useful on a temporary basis, but subject to further refinement (including larger longitudinal panels and thus more stable autocorrelational data).*

We made one exception to the above procedure of selecting the median reliability estimate. The measure of heavy drinking in past two weeks showed particularly low reliability estimates in Table B-1; and when those estimates were then used to estimate stability, the results seemed remarkably high. It may well be the case that further analysis will convince us that the most appropriate reliability estimate for the heavy drinking dimension does lie somewhere within the range shown in Table B-1 (.54 to .60); however, for present purposes we felt an estimate of .56 (the median) would produce too large an adjustment.* Instead, we elected to estimate reliability for this measure as .64. (Lest this value seem strange as well as arbitrary, we should point out that the square root of .64 is .80, and that is the value which is used in making adjustments.)

---

*It is worth noting here that we also computed reliability estimates using the procedure recommended by Wiley and Wiley (1970), which assumes equal error variance rather than equal reliabilities. For each of the reliability estimates shown in the final column of Table B-1, the Wiley and Wiley method produced a trio of values (one for each of the three points in time). The three values in each trio were highly similar to the corresponding estimate generated by the Heise method (indeed, the "Time 2" estimate was always identical to the Heise estimate; and the others were generally distributed one slightly higher and one slightly lower). Thus, for each of the drug use dimensions (except heavy drinking), the median value of the nine reliability estimates by the Wiley and Wiley method was identical to the median value of the three estimates by the Heise method.

At this point it may be useful to digress just long enough to outline the way we used the reliability estimates to make adjustments in our correlation matrix. Any correlation involving a drug use measure was divided by the square root of the reliability estimate for that measure. Thus, for example, we estimated reliability for the cigarette use measure to be .89, the square root of which is .943. Any correlation involving a cigarette use measure was divided by .943, yielding a correlation "adjusted for measurement unreliability" which was modestly higher than the unadjusted correlation. Of course, any correlation between two cigarette use measures involved two such adjustments, which is mathematically equivalent to dividing the correlation once by the reliability estimate. Thus, as shown in Table 5, the (unadjusted) autocorrelation between senior year cigarette use and use three years later was .70, but after taking account of reliability (i.e., after dividing the correlation of .70 by .89) we obtained an adjusted value of .79.

Returning now to the matter of the reliability estimate for the heavy drinking measure, let us consider the nature of the adjustments which are made when we estimate reliability at .64. Any correlation between the heavy drinking measure and some other (non-drug use) measure is divided by .80 (the square root of .64) in order to produce a correlation "adjusted for unreliability." For example, an unadjusted correlation of .40 yields an adjusted value of .50. The effect of this adjustment, in other words, is to "inflate" the original correlation to a value 25 percent larger. Of course, if we are dealing with heavy drinking at two points in time, the correction is applied twice (once for each measure), which is the same as dividing once by .64. Thus, an autocorrelation involving the heavy drinking measure is "inflated" to something 56 percent larger than the original. (Table 5 provides three examples, the first of which is an adjustment from .51 to .80.) As indicated earlier, we were unwilling to adopt a lower reliability estimate and thus produce a greater "inflation factor." We considered it more appropriate for present purposes to be a bit conservative. Additionally, we found that estimating reliability for the heavy drinking measure at .64 yielded stability estimates for heavy drinking which are strikingly similar to those for the other measure of alcohol use and the measure of marijuana use (see Table 5). We felt more comfortable doing this than adopting the median reliability value of .56, which would have yielded distinctly higher stability estimates.

Our discussion throughout this appendix has emphasized the tentative nature of the adjustments for reliability employed in this paper. As noted earlier, it seems likely that further work will result in improved estimates. However, it also seems likely to us that making adjustments using the present imperfect estimates is a great deal better than using no adjustments at all—at least if we are trying to develop a more accurate understanding of the "real" underlying relationships. Nevertheless, we have been at some pains to provide unadjusted as well as adjusted correlations in our tables of results, and we have also provided the complete unadjusted correlation matrix in Appendix C. Perhaps most important, we have carefully examined both the adjusted and unadjusted relationships reported in this paper, and we are satisfied that our basic substantive conclusions are supported by both versions of the data.

---

*The median for the nine reliability estimates using the Wiley and Wiley (1970) procedure is .58.

Table B-1

Selected Autocorrelations and Estimates of Reliability for Drug Use Measures[a]

		Autocorrelations			
	Class of	(1) r_{BY-78}	(2) r_{BY-80}	(3) r_{78-80}	(4) Test-Retest Reliability[b]
Cigarette Use in Past Month	1975	.7198	.7392	.7529	.733
	1976	.7506	.6435	.7986	.932
	1977	.7964	.7259	.8111	.890
Intervals of Heavy Drinking in Past 2 Weeks	1975	.4546	.4041	.4837	.544
	1976	.3912	.3912	.5594	.559
	1977	.5197	.4290	.4983	.604
Alcohol Use in Past Year	1975	.6432	.5757	.7850	.877
	1976	.6671	.5963	.7815	.874
	1977	.7219	.5878	.6801	.835
Marijuana Use in Past Year	1975	.5877	.5280	.7961	.886
	1976	.6258	.5325	.8206	.964
	1977	.7317	.6159	.7614	.905
Other Illicit Drug Use in Past Year	1975	.4319	.3565	.6027	.730
	1976	.4827	.3703	.5733	.747
	1977	.6036	.4407	.5028	.689

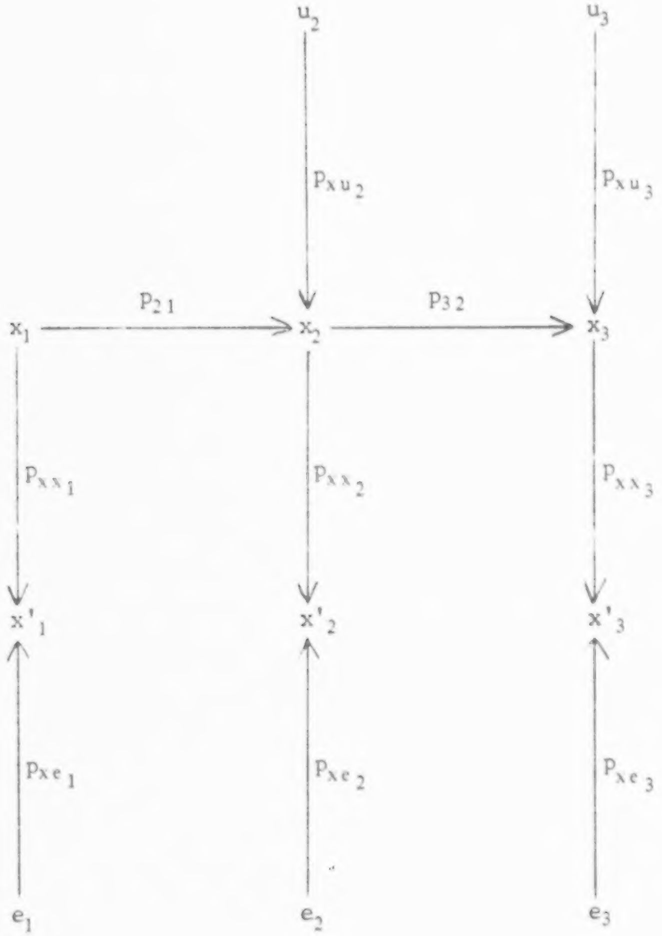
[a] Only those respondents with good data at all three collection points for a particular drug are involved in the analyses for that drug.

[b] Test-retest reliability is computed as follows:

$$\frac{r_{BY-78}\, r_{78-80}}{r_{BY-80}}$$

Figure B-1

Single-Variable Three-Wave Panel Model
(Adapted from Heise, 1969, p. 96)


u2
u3
Pxu2
Pxu3
P21
P32
x1
x2
x3
Pxx1
Pxx2
Pxx3
x'1
x'2
x'3
Pxe1
Pxe2
Pxe3
e1
e2
e3

APPENDIX C

Matrix of Product-Moment Correlations

The following pages contain a matrix of product-moment correlations for all pair-wise combinations of 56 variables used in the regression analyses reported in this paper. The first page includes numbers of cases (unweighted and weighted), means, standard deviations, and ranges.

A few respondents were excluded from this analysis because they had missing data on the sex identification measure. Missing data on other measures accounts for the variation in numbers of cases. A number of the measures are dummy variables (with a range from 0.00 to 1.00); for these measures there were no missing data, since all those lacking a positive response to the item (coded 1.00) were coded 0.00.

It is important to keep in mind that the correlations in this matrix are unadjusted; in other words, there has been no upward adjustment of correlations to take account of reliability limitations in the drug use measures. An adjusted version of this correlation matrix, using the adjustment factors shown in Table 5 and discussed at length in Appendix B, was used for all regression analyses reported in this occasional paper. Anyone wishing to repeat any of our regression analyses without adjustments or with different adjustment factors, and anyone wishing to carry out regression analyses with other combinations of the 56 variables, can do so by using the data in this appendix.

VAR NO	NAME	N	WEIGHTED N	MEAN	STANDARD DEVIATION	RANGE	
						MIN	MAX
V302	BY B02 :#CIGS SMKD/30DAY	7923	5999.67	1.8824	1.4105	1.00	7.00
V702	FU B02 |#CIGS SMKD/30DAY	7810	5925.33	2.0720	1.6358	1.00	7.00
V308	BY B06 :5+DRK ROW/LST 2W	7649	5789.67	1.8527	1.3060	1.00	6.00
V708	FU B06 |5+DRK ROW/LST 2W	7856	5964.67	1.9028	1.2851	1.00	6.00
V179	BY R :ALC COMP 2-11	7536	5678.67	5.4509	2.3792	2.00	11.00
V579	FU.R :ALC COMP 2-11	7719	5850.33	6.1308	2.4211	2.00	11.00
V173	BY R :MARJ COMP 2-11	7771	5877.67	3.9194	2.7554	2.00	11.00
V573	FU.R :MARJ COMP 2-11	7854	5973.33	4.2081	2.8928	2.00	11.00
R153	BY:OTH ILLCT DGS,12MOS	7883	5939.67	2.3930	0.7464	2.00	5.00
R553	FU:OTH ILLCT DGS,12MOS	7936	6025.33	2.4933	0.8072	2.00	5.00
R501	LIVE W SPOUSE	8131	6181.67	0.1202	0.3253	0.00	1.00
R502	LIVE W PARTNER	8131	6181.67	0.0403	0.1968	0.00	1.00
R503	LIVE W PARENT	8131	6181.67	0.4686	0.4990	0.00	1.00
R504	LIVE OTHER ARRGMT	8131	6181.67	0.1921	0.3940	0.00	1.00
R505	LIVE DORMS	8131	6181.67	0.1788	0.3832	0.00	1.00
R506	LIVE DORM+OTHER	8131	6181.67	0.3708	0.4831	0.00	1.00
R507	NON-STUDENT	8131	6181.67	0.4463	0.4971	0.00	1.00
R508	<HALFTIME ST	8131	6181.67	0.0427	0.2022	0.00	1.00
R509	HALFTIME ST	8131	6181.67	0.0325	0.1774	0.00	1.00
R510	FULLTIME ST	8131	6181.67	0.4423	0.4967	0.00	1.00
R511	PARTTIME ST	8131	6181.67	0.0752	0.2638	0.00	1.00
R512	FULLTIME JOB	8131	6181.67	0.4017	0.4903	0.00	1.00
R513	PARTTIME JOB	8131	6181.67	0.2269	0.4188	0.00	1.00
R514	UNEMPLOYED	8131	6181.67	0.0500	0.2180	0.00	1.00
R515	FT MILITARY	8131	6181.67	0.0229	0.1495	0.00	1.00
R516	FT HOMEMAKER	8131	6181.67	0.0286	0.1666	0.00	1.00
R517	DO OTHER	8131	6181.67	0.2700	0.4440	0.00	1.00
V350	BY C03 :R'S SEX	8131	6181.67	1.5363	0.4987	1.00	2.00
V150	BY R :RACE DICH|B=1	7412	5652.67	0.1083	0.3107	0.00	1.00
V379	BY C20 :R HS GRADE/D=1	7689	5849.67	5.8964	1.8745	1.00	9.00
V159	BY R :TRUANCY 10 -65	7295	5541.67	16.6036	9.8137	10.00	65.00
V158	BY R :RELIGIOUS COMITMNT	7835	5952.33	28.4617	8.9286	10.00	40.00
V367	BY C12 :R'POL BLF RADCL	5817	4395.00	3.2342	1.0042	1.00	6.00
V394	BY C25 :#X/AV WK GO OUT	7607	5793.00	3.5889	1.3118	1.00	6.00
V395	BY C26 :#X DATE 3+/WK	7524	5727.33	3.4334	1.6171	1.00	6.00
R558	FU :RELIGIOUS COMMITMENT	8002	6086.00	27.6980	8.8083	10.00	40.00
V791	FU C22 |R'POL BLF RADCL	5751	4374.33	3.1722	0.9634	1.00	6.00
V794	FU C25 |#X/AV WK GO OUT	8021	6100.33	3.3998	1.3028	1.00	6.00
V795	FU C26 |#X DATE 3+/WK	7979	6073.67	3.6118	1.4907	1.00	6.00
V749	FU C02 |R'S # CHLDRN/3+	8030	6110.00	0.0959	0.3651	0.00	3.00
V781	FU C17 |# MOS R WRKD=12	7329	5546.33	5.6268	4.4057	0.00	12.00
V782	FU C18 |AMT $ R MADE/YR	7194	5451.33	4.5693	3.4611	0.00	17.00
V783	FU C19A|ALL R$ FRM SELF	7621	5791.00	3.2896	1.9960	0.00	6.00
V785	FU C19C|ALL R$ FRM PRNT	7399	5646.33	2.3947	1.9276	0.00	6.00
V789	FU C20 |#WKS -EMP LSTYR	7867	5980.33	1.3693	2.1481	0.00	7.00
R8051	LIVE ON FARM	8131	6181.67	0.0439	0.2050	0.00	1.00
R8052	LIVE IN COUNTRY	8131	6181.67	0.1130	0.3166	0.00	1.00
R8053	LIVE IN SML TOWN	8131	6181.67	0.3387	0.4733	0.00	1.00
R8054	LIVE IN MED CITY	8131	6181.67	0.1595	0.3662	0.00	1.00
R8055	LIVE SUBURB MED CITY	8131	6181.67	0.0581	0.2340	0.00	1.00
R8056	LIVE IN LRG CITY	8131	6181.67	0.0993	0.2991	0.00	1.00
R8057	LIVE SUBURB LRG CITY	8131	6181.67	0.0678	0.2515	0.00	1.00
R8058	LIVE IN VERY LRG CITY	8131	6181.67	0.0505	0.2190	0.00	1.00
R8059	LIVE SUBURB VRY LRG CITY	8131	6181.67	0.0503	0.2185	0.00	1.00
V502	FU |CLASS YEAR	8131	6181.67	77.1417	1.1145	75.00	79.00
R1	PANEL YEAR	8131	6181.67	1.9224	0.8082	1.00	3.00

APPENDIX C MATRIX OF PRODUCT-MOMENT CORRELATIONS

		V302	V702	V308	V708	V179	V579	V173	V573
BY B02 :#CIGS SMKD/30DAY	V302	1.000							
FU B02 |#CIGS SMKD/30DAY	V702	.741	1.000						
BY B06 :5+DRK ROW/LST 2W	V308	.339	.279	1.000					
FU B06 |5+DRK ROW/LST 2W	V708	.240	.269	.471	1.000				
BY R :ALC COMP 2-11	V179	.390	.334	.658	.482	1.000			
FU.R :ALC COMP 2-11	V579	.244	.290	.442	.625	.651	1.000		
BY R :MARJ COMP 2-11	V173	.448	.365	.489	.357	571	.413	1.000	
FU.R :MARJ COMP 2-11	V573	.320	.346	.369	.425	.458	.522	.678	1.000
BY:OTH ILLCT DGS,12MOS	R153	.384	.305	.382	.246	.401	.267	.617	.424
FU:OTH ILLCT DGS,12MOS	R553	.298	.316	.337	.353	.384	.412	.554	.648
LIVE W SPOUSE	R501	.059	.022	-.036	-.146	-.044	-.165	-.040	-.122
LIVE W PARTNER	R502	.098	.108	.041	.001	.063	.053	.103	.118
LIVE W PARENT	R503	015	.002	023	-.010	-.026	-.060	.004	-.063
LIVE OTHER ARRGMT	R504	.017	.053	.061	.101	.080	.129	.061	.122
LIVE DORMS	R505	-.137	-.130	-.083	.033	.043	.060	-.086	.000
LIVE DORM+OTHER	R506	-.095	-.060	-.016	.108	031	.152	-.019	.099
NON-STUDENT	R507	.205	.189	.116	.024	.079	-.017	.107	.035
<HALFTIME ST	R508	.010	.015	-.013	-.019	000	.004	.001	-.004
HALFTIME ST	R509	-.007	.000	.015	-.007	.000	-.021	.012	.002
FULLTIME ST	R510	-.215	-.208	-.126	-.014	-.080	.028	-.117	-.032
PARTTIME ST	R511	.003	.012	.000	-.019	000	-.011	.008	-.002
FULLTIME JOB	R512	.141	.141	.117	.046	107	.045	.086	.048
PARTTIME JOB	R513	-.083	-.084	-.064	-.044	-.064	-.011	-.062	-.025
UNEMPLOYED	R514	.057	.052	.013	-.005	-.006	-.038	.043	.011
FT MILITARY	R515	.032	.051	.026	.056	028	.054	.026	.035
FT HOMEMAKER	R516	.011	.002	-.050	-.085	-.069	-.127	-.022	-.071
DO OTHER	R517	-.120	-.121	-.064	006	-.038	.009	-.057	-.020
BY C03 :R'S SEX	V350	.027	.019	-.198	-.244	-.153	-.202	-.109	-.155

APPENDIX C MATRIX OF PRODUCT-MOMENT CORRELATIONS

		V302	V702	V308	V708	V179	V579	V173	V573
BY R :RACE DICH|B=1	V150	-.071	-.045	-.123	-.128	-.199	-.210	-.068	-.050
BY C20 :R HS GRADE/D=1	V379	-.242	-.215	-.236	-.148	-.180	-.081	-.210	-.126
BY R :TRUANCY 10 -65	V159	.288	.242	.354	.224	.360	.256	.403	.310
BY R :RELIGIOUS COMITMNT	V158	-.194	-.178	-.200	-.165	-.270	-.227	-.291	-.251
BY C12 :R'POL BLF RADCL	V367	.119	.098	.093	.051	.151	.147	.201	.171
BY C25 :#X/AV WK GO OUT	V394	.245	.198	.322	.226	.355	.247	.347	.265
BY C26 :#X DATE 3+/WK	V395	.176	.130	.173	.083	.209	.097	.178	.110
FU :RELIGIOUS COMMITMENT	R558	-.174	-.187	-.162	-.226	-.258	-.318	-.265	-.311
FU C22 |R'POL BLF RADCL	V791	.102	.104	.080	.080	.122	.163	.176	.240
FU C25 |#X/AV WK GO OUT	V794	.110	.136	.231	.337	.239	.324	.226	.295
FU C26 |#X DATE 3+/WK	V795	.115	.100	.150	.083	.180	.132	.120	.078
FU C02 |R'S # CHLDRN/3+	V749	.042	.041	-.010	-.075	-.034	-.110	.004	-.058
FU C17 |# MOS R WRKD=12	V781	.142	.150	.129	.076	.115	.064	.089	.052
FU C18 |AMT $ R MADE/YR	V782	.126	.130	.158	.097	.155	.114	.097	.056
FU C19A|ALL R$ FRM SELF	V783	.124	.134	.142	.113	.138	.125	.122	.117
FU C19C|ALL R$ FRM PRNT	V785	-.138	-.134	-.105	-.038	-.082	-.020	-.085	-.044
FU C20 |#WKS -EMP LSTYR	V789	.072	.078	.016	.005	-.029	-.039	.063	.063
LIVE ON FARM	R8051	.021	.006	.012	-.020	-.003	-.047	-.055	-.088
LIVE IN COUNTRY	R8052	.047	.022	.014	-.028	-.028	-.075	-.023	-.033
LIVE IN SML TOWN	R8053	-.021	-.008	-.015	.024	.006	.019	-.018	-.014
LIVE IN MED CITY	R8054	-.017	-.014	.006	.013	.010	.032	-.017	.005
LIVE SUBURB MED CITY	R8055	.017	.014	-.010	-.010	-.020	-.017	.019	.017
LIVE IN LRG CITY	R8056	-.026	-.024	-.024	-.006	-.025	.009	.000	.020
LIVE SUBURB LRG CITY	R8057	.012	.011	.020	.006	.036	.030	.052	.028
LIVE IN VERY LRG CITY	R8058	-.019	-.001	-.020	-.016	-.002	.001	.018	.033
LIVE SUBURB VRY LRG CITY	R8059	.001	.001	.006	.006	.012	.025	.037	.033
FU |CLASS YEAR	V502	-.023	-.036	.027	.025	.023	-.019	.059	-.018
PANEL YEAR	R1	.016	.038	-.016	-.010	-.012	.042	-.036	.011

APPENDIX C MATRIX OF PRODUCT-MOMENT CORRELATIONS

		R153	R553	R501	R502	R503	R504	R505	R506
BY:OTH ILLCT DGS,12MOS	R153	1.000							
FU:OTH ILLCT DGS,12MOS	R553	.502	1.000						
LIVE W SPOUSE	R501	.005	-.092	1.000					
LIVE W PARTNER	R502	.102	.106	-.076	1.000				
LIVE W PARENT	R503	-.004	-.041	-.347	-.193	1.000			
LIVE OTHER ARRGMT	R504	.045	.110	-.180	-.100	-.458	1.000		
LIVE DORMS	R505	-.097	-.035	-.172	-.096	-.438	-.227	1.000	
LIVE DORM+OTHER	R506	-.041	.062	-.284	-.157	-.721	.635	.608	1.000
NON-STUDENT	R507	.121	.059	.287	.051	.101	.011	-.414	-.319
<HALFTIME ST	R508	.018	-.003	.008	.015	.060	-.003	-.089	-.073
HALFTIME ST	R509	.005	.012	-.028	.013	.070	-.001	-.074	-.060
FULLTIME ST	R510	-.132	-.060	-.280	-.066	-.156	-.032	.507	.376
PARTTIME ST	R511	.017	.006	-.012	.021	.093	-.004	-.118	-.096
FULLTIME JOB	R512	.084	.066	.111	.046	.192	-.014	-.354	-.292
PARTTIME JOB	R513	-.056	-.046	-.122	-.036	.097	-.058	.055	-.003
UNEMPLOYED	R514	.035	.034	.076	.027	.031	-.013	-.105	-.094
FT MILITARY	R515	.013	.002	-.003	.007	-.138	.235	-.063	.142
FT HOMEMAKER	R516	-.005	-.054	.309	.004	-.110	-.057	-.062	-.096
DO OTHER	R517	-.059	-.026	-.159	-.035	-.231	.019	.435	.360
BY C03 :R'S SEX	V350	-.014	-.049	.140	.048	-.030	-.086	-.016	-.083
BY R :RACE DICH|B=1	V150	-.096	-.089	-.041	.049	.027	-.023	-.002	-.020
BY C20 :R HS GRADE/D=1	V379	-.135	-.107	-.041	-.027	-.141	-.003	.232	.183
BY R :TRUANCY 10 -65	V159	.317	.292	.002	.065	.013	.036	-.088	-.041

APPENDIX C MATRIX OF PRODUCT-MOMENT CORRELATIONS

		R153	R553	R501	R502	R503	R504	R505	R506
BY R :RELIGIOUS COMITMNT	V158	-.215	-.202	.057	-.093	-.032	-.051	.093	.033
BY C12 :R'POL BLF RADCL	V367	.169	.167	-.029	.053	-.009	.017	-.010	.006
BY C25 :#X/AV WK GO OUT	V394	.255	.220	.011	.045	.010	.013	-.058	-.036
BY C26 :#X DATE 3+/WK	V395	.136	.097	.192	.073	-.051	-.045	-.085	-.105
FU :RELIGIOUS COMMITMENT	R558	-.186	-.246	.066	-.103	.012	-.078	.060	-.015
FU C22 |R'POL BLF RADCL	V791	.138	.175	-.072	.055	-.032	.039	.030	.056
FU C25 |#X/AV WK GO OUT	V794	.136	.215	-.230	-.041	.124	.052	.002	.044
FU C26 |#X DATE 3+/WK	V795	.083	.076	.048	.066	.019	-.014	-.086	-.080
FU C02 |R'S # CHLDRN/3+	V749	.006	-.048	.365	.056	-.134	-.061	-.103	-.132
FU C17 |# MOS R WRKD=12	V781	.092	.065	.159	.038	.019	.080	-.271	-.144
FU C18 |AMT $ R MADE/YR	V782	.076	.064	.156	.034	.060	.048	-.285	-.182
FU C19A|ALL R$ FRM SELF	V783	.101	.094	-.060	.063	.125	.127	-.276	-.115
FU C19C|ALL R$ FRM PRNT	V785	-.084	-.051	-.292	-.053	.016	-.074	.315	.196
FU C20 |#WKS -EMP LSTYR	V789	.065	.088	-.032	.043	.089	-.038	-.073	-.088
LIVE ON FARM	R8051	-.014	-.047	.042	-.017	.095	-.058	-.091	-.119
LIVE IN COUNTRY	R8052	-.013	-.024	.087	-.013	.081	-.070	-.101	-.137
LIVE IN SML TOWN	R8053	-.010	-.013	.015	-.012	-.100	.001	.123	.098
LIVE IN MED CITY	R8054	-.014	-.002	-.010	.011	-.056	.037	.037	.060
LIVE SUBURB MED CITY	R8055	.019	.020	-.024	.004	.065	-.034	-.031	-.052
LIVE IN LRG CITY	R8056	-.008	-.001	-.031	.031	-.059	.066	.019	.069
LIVE SUBURB LRG CITY	R8057	.028	.028	-.034	-.012	.068	-.013	-.040	-.042
LIVE IN VERY LRG CITY	R8058	.012	.015	-.032	.015	-.009	.011	.020	.025
LIVE SUBURB VRY LRG CITY	R8059	.024	.039	-.037	-.007	.067	-.011	-.041	-.042
FU |CLASS YEAR	V502	.012	.009	-.127	-.036	.097	-.092	.093	-.001
PANEL YEAR	R1	-.009	.038	.171	.047	-.146	.149	-.132	.016

APPENDIX C MATRIX OF PRODUCT-MOMENT CORRELATIONS

		R507	R508	R509	R510	R511	R512	R513	R514
NON-STUDENT	R507	1.000							
<HALFTIME ST	R508	-.190	1.000						
HALFTIME ST	R509	-.165	-.039	1.000					
FULLTIME ST	R510	-.800	-.188	-.163	1.000				
PARTTIME ST	R511	-.256	.741	.643	-.254	1.000			
FULLTIME JOB	R512	.527	.123	.005	-.598	.097	1.000		
PARTTIME JOB	R513	-.325	-.042	.070	.347	.014	-.444	1.000	
UNEMPLOYED	R514	.217	-.048	-.042	-.204	-.065	-.188	-.124	1.000
FT MILITARY	R515	.091	.028	-.010	-.098	.015	-.125	-.083	-.035
FT HOMEMAKER	R516	.109	-.012	-.004	-.105	-.012	-.141	-.093	-.039
DO OTHER	R517	-.453	-.077	-.046	.506	-.090	-.498	-.329	-.140
BY C03 :R'S SEX	V350	.032	-.003	.005	-.032	.001	-.032	.025	.031
BY R :RACE DICH|B=1	V150	-.052	-.007	.035	.003	.018	-.065	-.016	.044
BY C20 :R HS GRADE/D=1	V379	-.272	-.027	-.037	.330	-.045	-.192	.119	-.103
BY R :TRUANCY 10 -65	V159	.091	.024	.028	-.114	.037	.079	-.039	.033
BY R :RELIGIOUS COMITMNT	V158	-.115	.001	-.007	.129	-.004	-.069	.054	-.036
BY C12 :R'POL BLF RADCL	V367	-.007	.012	.014	.000	.018	-.010	.005	.004
BY C25 :#X/AV WK GO OUT	V394	.080	.010	.012	-.087	.016	.088	-.058	.013
BY C26 :#X DATE 3+/WK	V395	.108	.017	-.002	-.120	.012	.105	-.063	.009
FU :RELIGIOUS COMMITMENT	R558	-.078	.012	-.002	.075	.008	-.049	.032	-.012
FU C22 |R'POL BLF RADCL	V791	-.024	.006	-.007	.027	.000	-.030	.032	-.006
FU C25 |#X/AV WK GO OUT	V794	.025	.024	.004	-.035	.021	.081	-.046	-.036
FU C26 |#X DATE 3+/WK	V795	.085	.023	.025	-.109	.035	.148	-.050	-.031
FU C02 |R'S # CHLDRN/3+	V749	.157	-.012	-.005	-.162	-.012	.007	-.087	.102
FU C17 |# MOS R WRKD=12	V781	.445	.094	.003	-.504	.074	.522	-.370	-.007
FU C18 |AMT $ R MADE/YR	V782	.369	.098	.032	-.427	.097	.476	-.219	-.034
FU C19A|ALL R$ FRM SELF	V783	.332	.088	.033	-.388	.090	.412	-.107	-.026

APPENDIX C MATRIX OF PRODUCT-MOMENT CORRELATIONS

		R507	R508	R509	R510	R511	R512	R513	R514
FU C19C|ALL R$ FRM PRNT	V785	-.409	-.057	-.013	.453	-.053	-.366	.128	-.049
FU C20 |#WKS -EMP LSTYR	V789	.070	-.016	.012	-.084	-.004	-.051	-.050	.200
LIVE ON FARM	R8051	.131	.000	-.035	-.128	-.023	.100	-.053	.065
LIVE IN COUNTRY	R8052	.154	-.016	-.009	-.145	-.019	.084	-.063	.074
LIVE IN SML TOWN	R8053	-.033	-.031	-.040	.072	-.051	-.052	-.007	-.002
LIVE IN MED CITY	R8054	-.047	-.010	.001	.049	-.007	-.035	.018	-.032
LIVE SUBURB MED CITY	R8055	-.017	.034	.030	-.002	.046	.009	.023	-.032
LIVE IN LRG CITY	R8056	-.056	.008	.020	.052	.020	-.011	.011	-.031
LIVE SUBURB LRG CITY	R8057	-.012	.032	.030	-.004	.045	.003	.046	-.013
LIVE IN VERY LRG CITY	R8058	-.049	.010	.005	.047	.011	-.034	.013	-.007
LIVE SUBURB VRY LRG CITY	R8059	-.035	.011	.034	.021	.032	.007	.037	-.011
FU |CLASS YEAR	V502	-.082	-.028	.002	.086	-.020	-.081	.042	.011
PANEL YEAR	R1	.123	.024	-.001	-.124	.017	.126	-.060	.006

		R515	R516	R517	V350	V150	V379	V159	V158
FT MILITARY	R515	1.000							
FT HOMEMAKER	R516	-.026	1.000						
DO OTHER	R517	-.093	-.104	1.000					
BY C03 :R'S SEX	V350	-.165	.159	-.007	1.000				
BY R :RACE DICH|B-1	V150	.010	.056	.041	.049	1.000			
BY C20 :R HS GRADE/D-1	V379	-.040	-.019	.170	.151	-.113	1.000		
BY R :TRUANCY 10 -65	V159	.020	-.022	-.063	-.086	-.071	-.209	1.000	
BY R :RELIGIOUS COMITMNT	V158	-.040	.016	.051	.132	.082	.158	-.179	1.000
BY C12 :R'POL BLF RADCL	V367	-.014	.006	.007	.013	-.003	-.003	.110	-.138
BY C25 :#X/AV WK GO OUT	V394	-.001	-.043	-.032	-.073	-.076	-.113	.249	-.088
BY C26 :#X DATE 3+/WK	V395	-.014	.053	-.076	.067	-.054	-.041	.134	-.014
FU :RELIGIOUS COMMITMENT	R558	-.056	.035	.035	.148	.088	.116	-.161	.738

APPENDIX C MATRIX OF PRODUCT-MOMENT CORRELATIONS

		R515	R516	R517	V350	V150	V379	V159	V158
FU C22 |R'POL BLF RADCL	V791	.003	-.010	.007	.014	.052	.028	.107	-.148
FU C25 |#X/AV WK GO OUT	V794	.040	-.126	.006	-.146	-.082	-.116	.172	-.068
FU C26 |#X DATE 3+/WK	V795	-.037	-.016	-.083	.077	-.067	-.052	.104	-.025
FU CO2 |R'S # CHLDRN/3+	V749	-.004	.276	-.078	.058	.162	-.066	.008	-.006
FU C17 |# MOS R WRKD=12	V781	.145	-.067	-.269	-.118	-.069	-.205	.105	-.090
FU C18 |AMT $ R MADE/YR	V782	.038	-.096	-.306	-.238	-.099	-.174	.104	-.095
FU C19A|ALL R$ FRM SELF	V783	.127	-.145	-.338	-.149	-.025	-.207	.100	-.090
FU C19C|ALL R$ FRM PRNT	V785	-.099	-.083	.366	.060	.000	.198	-.096	.071
FU C20 |#WKS -EMP LSTYR	V789	-.053	.043	.007	.054	.200	-.142	.049	-.040
LIVE ON FARM	R8051	-.031	.022	-.090	-.033	-.058	-.041	-.033	.012
LIVE IN COUNTRY	R8052	-.024	.055	-.083	-.004	-.005	-.066	-.016	-.011
LIVE IN SML TOWN	R8053	.009	-.026	.072	.029	-.044	.038	-.030	.026
LIVE IN MED CITY	R8054	-.003	.010	.034	.013	.019	.017	.017	.035
LIVE SUBURB MED CITY	R8055	.013	.011	-.025	.026	.016	-.028	-.003	-.011
LIVE IN LRG CITY	R8056	.007	-.014	.019	-.012	.055	.026	-.003	-.014
LIVE SUBURB LRG CITY	R8057	.005	-.009	-.038	-.005	-.024	.006	.047	-.024
LIVE IN VERY LRG CITY	R8058	.001	-.007	.031	-.012	.095	.041	-.002	-.004
LIVE SUBURB VRY LRG CITY	R8059	-.009	-.029	-.024	-.035	-.029	.009	.018	-.030
FU |CLASS YEAR	V502	-.018	-.028	.062	.014	.031	-.043	.004	.001
PANEL YEAR	R1	.021	.020	-.100	-.013	-.026	.039	-.010	.002

APPENDIX C MATRIX OF PRODUCT-MOMENT CORRELATIONS

		V367	V394	V395	R558	V791	V794	V795	V749
BY C12 :R'POL BLF RADCL	V367	1.000							
BY C25 :#X/AV WK GO OUT	V394	.104	1.000						
BY C26 :#X DATE 3+/WK	V395	.002	.382	1.000					
FU :RELIGIOUS COMMITMENT	R558	-.149	-.084	-.003	1.000				
FU C22 |R'POL BLF RADCL	V791	.415	.049	-.020	-.203	1.000			
FU C25 |#X/AV WK GO OUT	V794	.049	.351	.126	-.087	.089	1.000		
FU C26 |#X DATE 3+/WK	V795	.022	.239	.414	-.021	-.001	.354	1.000	
FU C02 |R'S # CHLDRN/3+	V749	.004	-.008	.078	.027	-.031	-.171	-.054	1.000
FU C17 |# MOS R WRKD=12	V781	-.017	.095	.098	-.068	-.025	.089	.130	.028
FU C18 |AMT $ R MADE/YR	V782	-.013	.098	.105	-.090	-.033	.078	.139	.045
FU C19A|ALL R$ FRM SELF	V783	-.004	.081	.048	-.084	.004	.132	.129	-.024
FU C19C|ALL R$ FRM PRNT	V785	-.001	-.059	-.108	.066	.006	-.005	-.101	-.159
FU C20 |#WKS -EMP LSTYR	V789	.037	.007	-.052	-.021	.055	.025	-.043	.062
LIVE ON FARM	R8051	-.063	-.065	-.017	.033	-.068	-.048	-.034	.016
LIVE IN COUNTRY	R8052	-.028	-.022	.018	.019	-.021	-.014	.023	.028
LIVE IN SML TOWN	R8053	-.023	.016	.000	.017	-.010	-.001	-.005	.000
LIVE IN MED CITY	R8054	.015	.034	.020	.019	.010	.010	.007	-.021
LIVE SUBURB MED CITY	R8055	-.004	-.007	.006	-.010	-.001	.006	.009	-.005
LIVE IN LRG CITY	R8056	.010	-.032	-.032	-.017	.005	-.024	-.030	-.010
LIVE SUBURB LRG CITY	R8057	.021	.034	.006	-.029	.020	.037	.035	.008
LIVE IN VERY LRG CITY	R8058	.049	.003	-.006	-.014	.051	-.001	-.007	-.002
LIVE SUBURB VRY LRG CITY	R8059	.031	.015	-.006	-.043	.021	.028	-.007	-.021
FU |CLASS YEAR	V502	-.033	.003	.011	.055	-.012	.073	-.007	-.068
PANEL YEAR	R1	.021	-.007	-.017	-.042	-.010	-.112	.005	.097

APPENDIX C MATRIX OF PRODUCT-MOMENT CORRELATIONS

		V781	V782	V783	V785	V789	R8051	R8052	R8053
FU C17 |# MOS R WRKD=12	V781	1.000							
FU C18 |AMT $ R MADE/YR	V782	.688	1.000						
FU C19A|ALL R$ FRM SELF	V783	.527	.543	1.000					
FU C19C|ALL R$ FRM PRNT	V785	-.472	-.474	-.659	1.000				
FU C20 |#WKS -EMP LSTYR	V789	-.188	-.218	-.091	.044	1.000			
LIVE ON FARM	R8051	.058	.056	.017	-.043	.003	1.000		
LIVE IN COUNTRY	R8052	.081	.060	.050	-.086	.033	-.077	1.000	
LIVE IN SML TOWN	R8053	-.025	-.061	-.041	.022	-.031	-.153	-.255	1.000
LIVE IN MED CITY	R8054	-.039	-.031	-.036	.024	.019	-.093	-.156	-.312
LIVE SUBURB MED CITY	R8055	.005	.000	.012	.014	-.008	-.053	-.089	-.178
LIVE IN LRG CITY	R8056	-.026	-.015	-.010	.018	.001	-.071	-.119	-.238
LIVE SUBURB LRG CITY	R8057	.006	.024	.027	.003	.004	-.058	-.096	-.193
LIVE IN VERY LRG CITY	R8058	-.022	-.015	-.001	.026	.006	-.049	-.082	-.165
LIVE SUBURB VRY LRG CITY	R8059	-.022	.043	.013	.019	-.019	-.049	-.082	-.165
FU |CLASS YEAR	V502	-.142	-.121	-.081	.142	.080	.002	-.026	.013
PANEL YEAR	R1	.232	.267	.148	-.231	-.098	-.004	.008	-.003

		R8054	R8055	R8056	R8057	R8058	R8059	V502	R1
LIVE IN MED CITY	R8054	1.000							
LIVE SUBURB MED CITY	R8055	-.108	1.000						
LIVE IN LRG CITY	R8056	-.145	-.082	1.000					
LIVE SUBURB LRG CITY	R8057	-.118	-.067	-.090	1.000				
LIVE IN VERY LRG CITY	R8058	-.100	-.057	-.077	-.062	1.000			
LIVE SUBURB VRY LRG CITY	R8059	-.100	-.057	-.076	-.062	-.053	1.000		
FU |CLASS YEAR	V502	.006	.023	-.025	-.017	.000	.025	1.000	
PANEL YEAR	R1	-.012	-.028	.031	.005	.022	-.008	-.687	1.000

REFERENCES

Akers, R.L., Krohn, M.D., Lanza-Kaduce, L., & Radosevich, M. Social learning and deviant behavior: A specific test of a general theory. American Sociological Review, 1979, 44, 636-655.

Bachman, J. G., & Johnston, L. D. The Monitoring the Future project: Design and procedures. (Monitoring the Future Occasional Paper 1). Ann Arbor: Institute for Social Research, 1978.

Bachman, J. G., Johnston, L. D., & O'Malley, P. M. Monitoring the Future: Questionnaire responses from the nation's high school seniors, 1980. Ann Arbor: Institute for Social Research, 1981a.

Bachman, J. G., Johnston, L. D., & O'Malley, P. M. Smoking, drinking, and drug use among American high school students: Correlates and trends, 1975-1979. American Journal of Public Health, 1981b, 71, 59-69.

Bachman, J. G., & O'Malley, P. M. When four months equal a year: An explanation of inconsistencies in student's monthly versus yearly reports of drug use. (Monitoring the Future Occasional Paper 9). Ann Arbor: Institute for Social Research, 1980.

Bachman, J. G., & O'Malley, P. M. When four months equal a year: Inconsistencies in student reports of drug use. Public Opinion Quarterly, 1981, 45, 536-548.

Bachman, J. G., O'Malley, P. M., & Johnston, J. Youth in Transition, Volume VI: Adolescence to adulthood—A study of change and stability in the lives of young men. Ann Arbor: Institute for Social Research, 1978.

Bachman, J. G., O'Malley, P. M., & Johnston, L. D. Developing composite measures of drug use: Comparisons among lifetime, annual and monthly prevalence reports for thirteen classes of drugs (Monitoring the Future Occasional Paper 5). Ann Arbor: Institute for Social Research, 1979.

Bachman, J. G., O'Malley, P. M., & Johnston, L. D. Correlates of drug use, part I: Selected measures of background, recent experiences, and lifestyle orientations (Monitoring the Future Occasional Paper 8). Ann Arbor: Institute for Social Research, 1980.

Baltes, P. B., & Nesselroade, J. R. Cultural change and adolescent personality development: An application of longitudinal sequences. Developmental Psychology, 1972, 7, 244-256.

Clayton, R. R., & Voss, H. L. Shacking up: Cohabitation in the 1970's. Journal of Marriage and the Family, 1977, 39, 273-283.

Dearman, N. B., & Plisko, V. W. The Condition of Education: 1979. Washington, D.C.: National Center for Education Statistics, 1979.

Fishburne, P. M., Abelson, H. I., & Cisin, I. National survey on drug abuse: Main findings, 1979. Washington, D.C.: National Institute on Drug Abuse, 1980.

Greenberger, E., & Steinberg, L. D. The workplace as a context for the socialization of youth. Journal of Youth and Adolescence, 1981, 10 (June), 185-210.

Heise, D. R. Separating reliability and stability in test-retest correlation. American Sociological Review, 1969, 34, 93-101.

Henley, J. R., & Adams, L. D. Marijuana use in post-collegiate cohorts: Correlates of use, prevalence patterns and factors associated with cessation. Social Problems, 1973, 20, 514-520.

Jessor, R., & Jessor, S. L. Theory testing in longitudinal research on marijuana use. In D. B. Kandel (Ed.), Longitudinal research on drug use: Empirical findings and methodological issues. Washington, D.C.: Hemisphere Publishing, 1978.

Jessor, R., & Jessor, S. L. Problem behavior and psychological development: A longitudinal study of youth. New York: Academic Press, 1977.

Johnston, L. D. Drugs and American youth. Ann Arbor: Institute for Social Research, 1973.

Johnston, L. D., Bachman, J. G., & O'Malley, P. M. Drugs and the class of 1978: Behaviors, attitudes, and recent national trends (National Institute on Drug Abuse). Washington, D.C.: U.S. Government Printing Office, 1979.

Johnston, L. D., Bachman, J. G., & O'Malley, P. M. Highlights from Student drug use in America 1975-1980 (National Institute on Drug Abuse). Washington, D C.: U.S. Government Printing Office, 1981.

Johnston, L. D., Bachman, J. G., & O'Malley, P. M. Monitoring the Future: Questionnaire responses from the nation's high school seniors, 1981. Ann Arbor: Institute for Social Research, 1982.

Johnston, L. D., O'Malley, P. M., & Eveland, L. K. Drugs and delinquency: A search for causal connections. In D. G. Kandel (Ed.), Longitudinal research on drug use: Empirical findings and methodological issues. Washington, D.C.: Hemisphere Publishing, 1978.

Kandel, D. B. Adolescent marijuana use: Role of parents and peers. Science, 1973, 181, 1067-1070.

Kandel, D. B. Reaching the hard-to-reach: Illicit drug use among high school absentees. Addictive Diseases, 1975, 1, 465-480.

Kandel, D. B. Convergences in prospective longitudinal surveys of drug use in normal populations. In D. B. Kandel (Ed.), Longitudinal research on drug use: Empirical findings and methodological issues. Washington, D.C.: Hemisphere Publishing, 1978.

Kandel, D. B. Drug and drinking behavior among youth. Annual Review of Sociology, 1980, 6, 235-285.

Kandel, D. B., Kessler, R. C., & Margulies, R. Z. Antecedents of adolescent initiation into stages of drug use: A developmental analysis. In D. B. Kandel (Ed.), Longitudinal research on drug use: Empirical findings and methodological issues. Washington, D.C.: Hemisphere Publishing, 1978.

Kaplan, H. B. Deviant behavior and self enhancement in delinquency. Journal of Youth and Adolescence, 1978, 1, 253-279.

Kish, L. Survey sampling. New York: John Wiley & Sons, 1965.

Labouvie, E. W. Longitudinal designs. In P. M. Bentler, D. J. Lettieri, & G. A. Austin (Eds.), Data analysis strategies and designs for substance abuse research (Research Issues No. 13, National Institute on Drug Abuse). Washington, D.C.: U.S. Government Printing Office, December 1976.

National Institute on Drug Abuse. Marijuana and health: Eighth annual report. Washington, D.C.: Author, 1980.

O'Donnell, J. A., Voss, H. L., Clayton, R. R., Slatin, G., & Room, R. G. W. Young men and drugs--A nationwide survey (Research Monograph 5, National Institute on Drug Abuse). Washington, D.C.: U.S. Government Printing Office, 1976.

O'Malley, P. M., Bachman, J. G., & Johnston, L. D. Differentiation of period, age, and cohort effects on substance use among American youth (Monitoring the Future Occasional Paper 13). Ann Abor: Institute for Social Research, 1982.

Robins, L. N. The Vietnam drug user returns (Special Action Office Monograph: Series A, No. 2). Washington, D.C.: Executive Office of the President (Special Action Office for Drug Abuse Prevention), May 1974.

Ryder, N. B. The cohort as a concept in the study of social change. American Sociological Review, 1965, 30, 843-861.

Schaie, K. W. A general model for the study of developmental problems. Psychological Bulletin, 1965, 64, 92-107.

Wheaton, B., Muthen, B., Alwin, D. F., & Summers, G. F. Assesing reliability and stability in panel models. In D. Heise (Ed.), Sociological Methodology 1977. San Francisco: Jossey-Bass, 1977.

Wiley, D. E. & Wiley, J. A. The estimation of measurement error in panel data. American Sociological Review, 1970, 35, 112-117.

Wiley, J. A., & Wiley, M. G. A note on correlated errors in repeated measurements. Sociological Methods & Research, 1974, 3, 172-188.

ISR

SURVEY RESEARCH CENTER
INSTITUTE FOR SOCIAL RESEARCH
THE UNIVERSITY OF MICHIGAN